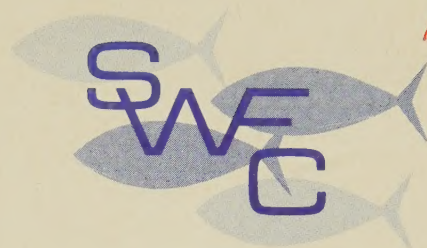




HONOLULU
LA JOLLA
MONTEREY
TIBURON

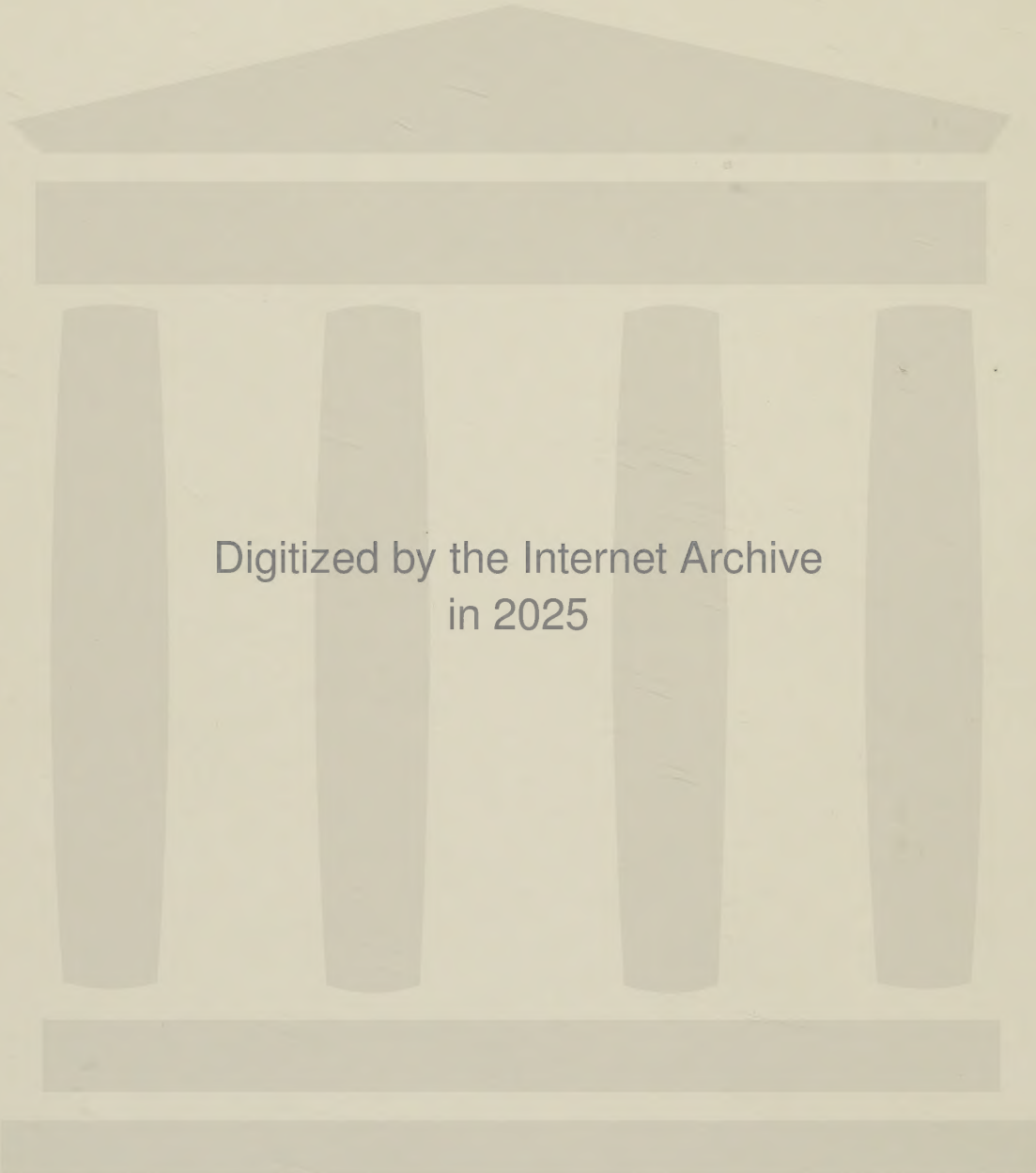


SOUTHWEST FISHERIES CENTER

MONTHLY REPORT - APRIL 1982

TABLE OF CONTENTS AND RESEARCH HIGHLIGHTS

	Page
PUBLICATIONS	1
HONOLULU LABORATORY	5
Scientists Will Use Submersible to Observe Bottom Fishing Operations	6
Data on Recreational Fishing in Hawaii Processed	7
LA JOLLA LABORATORY	11
White Sea Bass Spawned in Captivity for First Time	11
Harbor Seals Radio-Tagged for Study	28
1982 Billfish Newsletter Released	29
TIBURON LABORATORY	31
Potential for New Fishery Markets Explored	31
Spring Sampling of Striped Bass Planned	34
PACIFIC ENVIRONMENTAL GROUP	36
A Description of Eastern Boundary Current Comparative Studies	36
FISHERIES INFORMATION SYSTEMS AND AUTOMATIC DATA PROCESSING	38
Implementation of WPACFIN Proceeds	38
MISCELLANEOUS	41
Honors, Awards, Seminars, Public Affairs, Visitors, Meetings and Travel, and Personnel	41



Digitized by the Internet Archive
in 2025

* * * * *

*
*
* To change the delivery address of the
*
* Southwest Fisheries Center Monthly Report, or
*
* to cancel your subscription, please notify:
*
*
* Editor, Southwest Fisheries Center
* P. O. Box 271
* La Jolla, California 92038
*
*
* IZADORE BARRETT, Center Director
*
* JOHN F. CARR, Deputy Director
*
* LILLIAN VLYMEN and
*
* SHARI SITKO, Editors
*
* * * * *

SOUTHWEST FISHERIES CENTER
LA JOLLA, CALIFORNIA

HONOLULU LABORATORY
LA JOLLA LABORATORY
TIBURON LABORATORY
PACIFIC ENVIRONMENTAL GROUP

MONTHLY REPORT - APRIL 1982

STATUS OF PUBLICATIONS

Published

Adams, P.B., and C.J. Ryan. 1982. Morphology and growth of a pugheaded brown rockfish (Sebastes auriculatus). Calif. Fish and Game 68:54-57.

The morphology and growth of a pugheaded brown rockfish, Sebastes auriculatus, from San Francisco Bay were statistically compared to normal brown rockfish. The morphological comparisons showed that the shorter upper jaw is responsible for the exophthalmic condition and that the growth of body parts not directly affected by the pugheadness was in normal proportion to each other. The growth analysis showed that the pugheaded fish grew normally through most of the year, but during the winter, a period of food limitation, the fish's growth rate dropped significantly below that of the rest of the population. This indicated that the pugheaded fish was relatively fit in that it was able to survive, but in times of population stress it becomes a marginal member of the population.

Alvarino, Angeles. 1981. Siphonophorae, pp. 383-441. In Atlas del Zooplancton del Atlantico Sudoccidental [Zooplankton Atlas of the South Atlantic]. Instituto Nacional de Investigacion y Desarrollo (INIDEP). Mar del Plata, Argentina. 937 pp.

O'Connell, C.P., and P.A. Paloma. 1981. Histochemical indication of liver glycogen in samples of emaciated and robust larvae of the northern anchovy, Engraulis mordax. Fish. Bull., U.S. (Note) 79(4): 806-812.

THIS REPORT DOES NOT CONSTITUTE PUBLICATION AND IS FOR INFORMATION ONLY.

Squire, James L., and Howard Krumboltz. 1981. Profiling pelagic fish schools using airborne optical lasers and other remote sensing techniques. Mar. Tech. Soc. J. 15(4): 27-31.

Webb, Paul W. 1981. Responses of northern anchovy, Engraulis mordax, larvae to predation by a biting planktivore, Amphiprion percula. Fish. Bull., U.S. 79(4): 727-735.

Responses of northern anchovy larvae, ranging from 0.29 to 1.2 cm total length, to attacks by a biting planktivore, the clown fish, were recorded on video tape. Schlieren optics were used to simultaneously view an opaque predator and transparent prey. All fish were reared, and experiments performed, at 20° C. The percentage of larvae responding to attacks increased from about 9% for 0.29 cm larvae to 80% for 1.2 cm larvae. Of these larvae responding to attack, $26 \pm 10\%$ attempted to escape too late and were caught. This proportion was not related to larval size. The direction of larval escape paths to the initial orientation of the body was not related to larval size, but escape distances traveled and mean escape speeds increased with size from 1.0 cm and 4.0 cm/s respectively for larvae 0.29 cm total length to 3.5 cm and 8.2 cm/s in larvae 1.2 cm total length. Larval performance was not maximal except during rare chases which occurred in 7% of attacks by the predator.

Escape maneuvers in vertebrates are initiated by the magnifying retinal image of an approaching object, called the looming effect, and calculated as the rate of change of the angle subtended by the predator as seen by the prey. In the present study, apparent looming thresholds for larval avoidance responses were calculated at the start of the response, and differ from the true response because there must be a finite time difference between the stimulus exceeding the response threshold and the motor response itself (response latency). Maximum likelihood mean apparent looming thresholds were calculated for log-transformed data, assuming nonresponding prey had apparent looming thresholds greater than the maximum actually observed. These mean apparent looming thresholds decreased with larval length from approximately 32 rads/s at 0.29 to 1.7 rads/s at 1.2 cm. The most important feature of the larval avoidance response was that an escape attempt should be made appropriately timed to an attack.

The method could be used to examine larval fish responses in other interactions where predation events take place over a small distance. Examples are attacks by biting juvenile and adult fish, and other planktonic invertebrate predators. Effects of larval density and alternate prey species could also be evaluated.

Webb, Paul W., and R.S. Keyes. 1981. Division of labor between median fins in swimming dolphin (Pisces: Coryphaenidae). Copeia 4: 901-904.

Weihs, Daniel. 1981. Body section variations in sharks - an adaptation for efficient swimming. Copeia 1: 217-219.

Weihs, Daniel, R.S. Keyes, and D.M. Stalls. 1981. Voluntary swimming speeds of two species of large carcharhinid sharks. Copeia 1: 219-222.

Administrative Reports

Honolulu Laboratory

Ikehara, Walter N. 1981. A survey of the ika-shibi fishery in the State of Hawaii, 1980. SWFC Admin. Rep. H-82-4C.

Matsumoto, Walter M. 1982. The status of the squid fisheries in the United States of America. SWFC Admin. Rep. H-82-5.

[U.S.] National Marine Fisheries Service. 1982. Report of the Squid Workshop. SWFC Admin. Rep. H-82-7.

Polovina, Jeffrey J., Stephen Ralston, and Jerry A. Wetherall. 1982. Approaches to resource assessment for lobster, bottom fish, monk seal, and green turtle stocks in the Northwestern Hawaiian Islands. SWFC Admin. Rep. H-82-6.

Skillman, Robert A. 1982. Microcomputers and fisheries. SWFC Admin. Rep. H-82-8.

La Jolla Laboratory

Bartoo, Norman W., and S. Kume. 1982. Report of the Sixth North Pacific Albacore Workshop. SWFC Admin. Rep. LJ-82-02.

Approved by Center Director

Jennings, Jacqueline G., and Raymond K. Stives. Tracking dolphin movements by satellite. For consideration for publication in Nature.

Myrick, Albert C., Jr. Time significance of layering in some mammalian hard tissues and its application in population studies. For consideration for publication in Third International Therological Congress, Helsinki, Finland.

Ralston, Stephen, and Garrett T. Miyamoto. Analysis of the width of daily otolith increments: A method for studying age and growth in reef fish. For consideration for publication in Fishery Bulletin, U.S.

Smith, Tim D. Estimating the dolphin population size yielding
 maximum net production. For consideration for publication in
 IWC/SWFC - Cetacean Reproduction Conference Proceedings.

HONOLULU LABORATORY

INSULAR RESOURCES INVESTIGATION

Field Work in the Mariana Archipelago Continues

The first R/V Townsend Cromwell cruise (TC-82-01) has been completed and the second cruise (TC-82-02) started on the Resource Assessment Investigation of the Mariana Archipelago (RAIOMA) Task's study of the marine resources in the Mariana Archipelago. Research assistant Bert S. Kikkawa, Chief Scientist on the first cruise, returned to Honolulu after completing the cruise and Dr. Jeffrey J. Polovina, Leader of the RAIOMA Task, fishery biologist Robert B. Moffitt, and research assistant Victor A. Honda have embarked on the second cruise.

Townsend Cromwell cruise 82-01 was primarily a bathymetric and hydrographic cruise around the southern portion of the Mariana Islands (Guam to Farallon de Medinilla). Kikkawa found many crab megalops, plus billfish and flyingfish larvae in the neuston and vertical bongo net tows. He is presently processing the water samples collected on the cruise for chlorophyll and phaeo-pigment content. Other work included CTD and XBT casts and Secchi disc readings. Based on the preliminary results of the first cruise, Kikkawa noted that it would be interesting to expand the hydrographic survey to include the northern part of the archipelago where interactions between nearshore waters and the Kuroshio Current may be of increased importance. Kikkawa also reported that the Esmeralda Bank sulfur "boil" was relocated.

Polovina is serving as Chief Scientist on the second cruise, which is the first of three biological cruises scheduled in fiscal year 1983 for the area. Dr. Steven Amesbury and Richard Sakamoto of the University of Guam are also participating in the cruise. The Cromwell is scheduled to visit Anatahan, Pagan, Sarigan, Tinian, and Aguijan Islands and Esmeralda, Santa Rosa, and Galvez Banks, with a 2-day stopover in Saipan for an open house. Sampling will focus primarily on deepwater shrimp (*Heterocarpus* spp.), bottom fishes, and akule (*Selar crumenophthalmus*), although anchored longline gear for tunas and deepwater gill nets will also be employed on an experimental basis.

* * * * *

This month fishery biologist Richard N. Uchida began preliminary planning for R/V Townsend Cromwell cruise TC-82-05, scheduled for October-December 1982, which will involve specific experiments at selected locations in the Northwestern Hawaiian Islands and work on the North Pacific seamounts. He also reviewed a manuscript, "Seasonal variation of water temperature in the East Tsushima Strait," by T. Miida and S. Tawara, Shimonoseki University of Fisheries, Japan.

Manuscripts Describing Northwestern Hawaiian Islands Field Work Being Prepared

Richard N. Uchida, Leader of the Insular Ecosystem Study Task, reports that researchers in the Task are continuing to prepare manuscripts which describe the results of the 5-year field work in the Northwestern Hawaiian Islands (NWHI). For the NWHI fishery atlas, Uchida began revising several sections; fishery biologist James H. Uchiyama and research assistant Darryl T. Tagami updated the species list and began an analysis on the size of each species by fishing gear; research assistant Steven H. Kramer completed the first draft of a synopsis on wahoo (*Acanthocybium solandri*), and began a literature search on an octopus (*Polypus* [*Octopus*] *marmoratus*); research assistant Alan R. Everson completed synopses for ehu (*Etelis carbunculus*), onaga (*E. coruscans*), and kalekale (*Pristipomoides sieboldii*); and fishery biologist Reginald M. Gooding started work on a synopsis of sharks.

Uchiyama also revised a manuscript, "Length-weight and standard length-fork length relationships of deep-sea handline-caught fishes of the Northwestern Hawaiian Islands," which was co-authored by Tagami and computer programmer Sally H. Kuba, and began writing the first draft of a manuscript on the age and growth of snappers and carangids. Research assistant Robert L. Humphreys, Jr. revised a manuscript, "Size at maturity of the Hawaiian spiny lobster, *Panulirus marginatus*, from changes in relative growth"; Everson began preparation of a manuscript on the maturation and fecundity of ehu, onaga, and kalekale; Kramer began writing a short ichthyological note on the capture of a hagfish, *Eptatretus* sp.; and Gooding completed a draft report on the effect of lobster offal on trap catches of lobsters.

Planning Continues on Northwestern Hawaiian Islands Resource Survey Documentary Film

Fishery biologist Reginald M. Gooding, mathematical statistician Dr. Jeffrey Polovina, and Dr. Robert J. Shallenberger, U.S. Fish and Wildlife Service, met this month with George Darby, head of the East-West Center's audio and video production department, to discuss the documentary film on the cooperative research in the Northwestern Hawaiian Islands (NWHI). Because funds for the production of the film are not yet available, the group decided that it was more practical to produce a video version initially; a 16-mm version could be produced later, if desired. Shallenberger is preparing a flow chart to show the sequence of events leading to a finished production.

Scientists Will Use Submersible to Observe Bottom Fishing Operations

Fishery biologist Reginald M. Gooding reports that the Honolulu Laboratory's work with the Hawaii Undersea Research Laboratory's submersible, *Makalii*, has been firmly scheduled between May 5 and June 15. Within that period Gooding and Dr. Stephen Ralston will conduct eight dives along the southern edge of Penguin Bank. Some of the dives to observe bottom fishing

operations will be in collaboration with the commercial fishing vessel, Na Allii Kai.

FISHERY MANAGEMENT RESEARCH PROGRAM

Data Form Developed to Record Billfish Purchase Information

Dr. Robert A. Skillman, Leader of the Fishery Management Research Program, reports that program personnel have prepared a data form to record purchase information on billfish from fish dealers in Hawaii. The form was developed at the request of the Western Pacific Regional Fishery Management Council (WPRFMC) after the Council decided at its April meeting to add mahimahi, wahoo, and sharks to the draft billfish management plan. Current billfish domestic catch data are needed to show the impact of existing regulations under the preliminary management plan and the WPRFMC has begun a project to collect the required data from fish dealers. The data form developed by the Honolulu Laboratory staff members will record purchase information including number, weight, and revenue by species, vessel, and wholesale fish dealer. The WPRFMC meeting, held in American Samoa, was attended by William G. Gordon, Assistant Administrator for Fisheries, NOAA, and Dr. Izadore Barrett, Director, Southwest Fisheries Center.

Hawaiian Handline Fishery for Tuna Assessed

Research assistant Walter N. Ikehara visited a number of fish dealers on the island of Hawaii this month to assess the current situation of the handline fishery for tunas, including the number of boats participating in the fishery. This rapidly expanding fishery seems to be developing along two separate lines: a night fishery (ika-shibi) along the eastern coast and a day chum (palu ahi) fishery along the south and western coasts of Hawaii. Bycatches of swordfish and striped marlin are rather sizable in this fishery. The fish dealers handling the catches have promised to cooperate with the current attempt by the Western Pacific Regional Fishery Management Council to collect data on billfish and associated species (please see preceding article for additional details).

Data on Recreational Fishing in Hawaii Processed

Progress has been made by fishery biologist Thomas S. Hida in obtaining recreational fishing data in Hawaii. Data from March 28, 1979 through December 7, 1981 have been transcribed from the daily logbooks maintained by a local military charter fishing boat. These data are ready for coding in a computer processible form. Data from the January and February 1981 issues of "Hawaii Fishing News" have also been transcribed for evaluation on the adequacy of the draft coding forms. Catches of large pelagic species, some bottom fishes and coastal species are included, as well as weights of some fishes.

Skipjack Tuna Fishery Data to be Summarized

As part of the monitoring of the skipjack tuna fishery in Hawaii, the Laboratory has been receiving, on a confidential basis, data on the landings and value by market size-classes for bait boats belonging to the [Hawaii] Tuna Boat Owners' Co-op, Inc. Gary L. Kamer, Statistician, is preparing computer programs to routinely summarize these data on a quarterly and annual basis. These summaries will allow a close monitoring of about half the Hawaiian fleet.

Cumulative Hawaiian Skipjack Tuna Landings Far Below Long-Term Average

The April 1982 Hawaii landings of skipjack tuna were estimated at 74 metric tons (MT), which is 96 MT below the April 1981 landings and 138 MT below the 1964-79 long-term average for April. The cumulative landings from January through April were estimated at 216 MT which is 127 MT below the 1981 landings for the same period and 388 MT below the 1964-79 long-term average for the same period.

Fishery Economics Survey Continuing

Samuel G. Pooley, Industry Economist, reports that work is continuing on the tuna longline and deep-sea handline cost-earnings survey. The sample frame has been established for the tuna longline fleet, and the survey form has been tested in the field. After evaluation, the full field program will be implemented.

Manuscript on Seabird Food Study Completed

A manuscript on Hawaiian seabird feeding ecology by fishery biologist Thomas Hida, biological technician Michael Seki, and Craig S. Harrison, Wildlife Biologist for the U.S. Fish and Wildlife Service (USFWS) has been reviewed by Ralph Schreiber of the Natural History Museum at Los Angeles, the Technical Editor of the Editorial Department, USFWS, at Fort Collins, Colorado, and Dr. Bruce B. Collette of the Systematics Laboratory, NMFS, in Washington, D.C. The necessary corrections and changes are being made. The manuscript will be submitted to Wildlife Monographs.

* * * * *

Dr. Robert Skillman, Fishery Biologist, has completed a paper, "Microcomputers and fisheries," for the meeting of the Standing Committee on Resources Research and Development (SCORRAD), Indo-Pacific Fishery Commission (IPFC).

PELAGIC RESOURCES INVESTIGATION

Study of Magnetic Sense in Yellowfin Tuna Continues

Michael M. Walker, graduate student at the University of Hawaii, is continuing behavioral tests at the Honolulu Laboratory's Kewalo Research Facility to examine the ability of yellowfin tuna to detect alterations in the Earth's magnetic field. The fish are trained to swim through a hoop depending on whether the magnetic field around the tank has been altered. Earlier experiments of this type have shown that yellowfin tuna are able to detect relatively minor changes in the Earth's magnetic field. The most recent set of experiments have been run "double blind," i.e., the observer recording the data does not know whether or not the magnetic field is altered during a given experimental trial. This procedure precludes the experimenter from subconsciously cueing the animal in any way. The results of the double blind experiments showed that yellowfin tuna were indeed able to detect alterations in the Earth's magnetic field.

More Cooperative Work Planned with Japanese Scientists

Tamio Otsu, Chief of the Pelagic Resources Investigation, has received word from Dr. Teruo Harada that Kinki University has agreed to fund Dr. Harada's trip in June to Honolulu. Dr. Harada is planning to work with Dr. Richard W. Brill, Leader of the Pelagic Ecosystem Study Task, and his group on skipjack tuna spawning experiments. Dr. Harada is an established expert on fish culture and has carried out pioneering work on tuna culture in Japan.

Walter M. Matsumoto, Fishery Biologist, reports that the Honolulu Laboratory will be receiving five surplus squid jigging machines through the courtesy of Dr. Tsuneyoshi Suzuki of the Hokkaido University Faculty of Fisheries. The jigging machines and such accessories as squid-attracting lights, lines, and jigs will be shipped to Honolulu on the No. 1 Riasu Maru, a training vessel of the Iwate Prefectural Fisheries High School. The vessel is scheduled to arrive in Honolulu on July 4.

Mahimahi Spawning and Larvae Rearing Experiments Continue

During April the female mahimahi in the tank at the Honolulu Laboratory's Kewalo Research Facility spawned five times, averaging 40,000 eggs per spawning. The eggs were distributed among the Kewalo Research Facility, Oceanic Institute, and Waikiki Aquarium in an effort to determine optimal water quality and larval rearing techniques for mahimahi, skipjack tuna, and other pelagic fish species.

To date, the best results have been from a spawning on April 16. Eggs from this spawning had a mean diameter of 1.58 mm and hatched 40 h after fertilization, as expected. The freshly hatched larvae had a mean length of 4.97 mm and absorbed their yolk within 2 days. Feeding commenced by the third

day after hatching and the larvae were all darkly pigmented by this time. Work on mahimahi will continue until the start of the skipjack tuna spawning season, sometime around the first of June.

MARINE MAMMAL AND ENDANGERED SPECIES PROGRAM

Monk Seal Research Planning Session Held at Honolulu Laboratory

William G. Gilmartin, Leader of the Marine Mammal and Endangered Species Program, reports that a planning session led by David J. Mackett, Center Planning Officer, was held at the Honolulu Laboratory on April 13. The purpose of the planning session was to identify urgent research needs for the Hawaiian monk seal and to prepare a work plan for the next few years to meet these needs.

Gilmartin reviewed some of the ongoing monk seal research including the Kure work that was started earlier this year; the mark-recovery experiments, behavior, and haul-out observations at Lisianski; and the French Frigate Shoals aerial survey for pup production and identification of material in scat and spew samples. Then, based on the large number of research needs listed in the draft monk seal recovery plan, a chart showing the relationship of various research activities needed to accomplish one of the four major goals in monk seal research was developed.

Other attendees at the planning session included Honolulu Laboratory Director Richard S. Shomura, fishery biologists Dr. Jerry A. Wetherall, Richard N. Uchida, and Howard O. Yoshida; Robert DeLong, National Marine Mammal Laboratory, NMFS, Seattle, Washington; Eugene T. Nitta, Western Pacific Program Office, Southwest Region, NMFS; Dr. Robert Shallenberger, U.S. Fish and Wildlife Service; Dr. Philip Helfrich, University of Hawaii; Alvin Katekaru, Hawaii Division of Aquatic Resources; and Ralph Saito, State of Hawaii, Division of Forestry and Wildlife.

LA JOLLA LABORATORY

Coastal Fisheries Resources Division

COASTAL EASTERN PACIFIC: POPULATION BIOLOGY OF FISHES

White Sea Bass Spawned in Captivity for First Time

On March 13, white sea bass was spawned for the first time in captivity under controlled conditions at the Southwest Fisheries Center's La Jolla Laboratory. The spawning breakthrough was the culmination of a 2 year effort by fishery biologist Roderick Leong to raise white sea bass in the laboratory for life cycle studies. According to Dr. John Hunter, who heads the program on population biology of fishes at the Center, no one even knew what a white striped bass egg or larva looked like until work began at the Southwest Fisheries Center. The larvae experience a high mortality in the wild and the early life history of this species is almost unknown because until now it was not possible to obtain suitable quantities of eggs for study purposes.

The fish comprising the Center's brood stock were collected over a period of more than 2 years. Leong canvassed the sport-fishing landings around San Diego, California, and asked boat owners to save live, undersized fish for him. He had decided to capture only immature fish and allow them to grow to sexual maturity in captivity because adult white sea bass can reach a weight of more than 80 pounds and are 3-4 feet long, a difficult size to catch and transport to the aquarium in a healthy and undamaged condition.

Leong put the undersized fish, which measured about 15 inches, into sea water tanks at the Center. He developed a regime of optimal water quality, careful temperature maintenance, disease control, and abundant food (primarily anchovy) and was able to accelerate the growth and development of the fish to 3-4 times the normal rate of growth in nature. When the fish were 2 to 3 years-old, Leong induced sexual maturity in them by controlling day length with artificial light and by maintaining the preferred water temperature in the tanks. As of this writing, one young fish from these spawnings (Figure 1) has survived the critical larval stage and is now one inch in length, and approximately 1,000 others are now in the larval stage.

The procedure developed by Leong will finally give fishery scientists enough viable eggs for rearing and laboratory studies. Researchers will have the opportunity to study the white sea bass from egg to adult and may finally be able to construct a more complete picture of the life cycle of this valuable commercial and recreational fish.

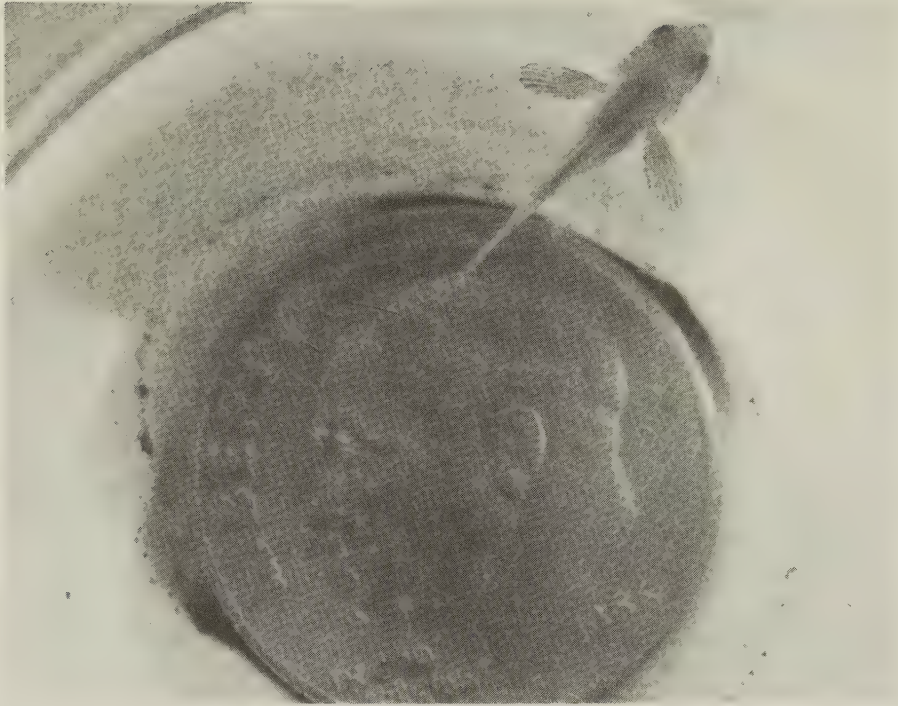


Figure 1. First white sea bass spawned in captivity is shown in comparison with a dime. (Photo courtesy of the Union-Tribune Publishing Company).

Historic Record of Spawning Rate of Northern Anchovy Examined

Dr. John Hunter, Fishery Biologist, reports that analysis of histological evidence from four spawning seasons (1978-1982) of northern anchovy indicates that during the peak months of spawning (January-April), from 10-15% of the mature females spawn per day. This is an important characteristic of anchovy life history because the frequency of spawning is used as a parameter for biomass estimation and, along with fecundity, determines the reproductive effort of the population.

In order to determine if this high rate of spawning has been a consistent feature of the reproductive biology of the anchovy, Hunter examined the maturity stages of ovaries of females taken by California Department of Fish and Game (CDF&G) personnel during their acoustic-trawl surveys. CDF&G biologists staged the ovaries of female anchovy taken in their surveys since 1966 and these data were put into tabular form by Donna Mallicoate, Statistician at the Southwest Fisheries Center's Pacific Environmental Group, Monterey, California. Hydrated ovaries (CDF&G Stages 5-6) which can be identified with reasonable accuracy using gross anatomical criteria, have a duration of less than 24 hours and consequently can be used as an index of the daily frequency of spawning. Spawning soon follows the complete hydration of the ovary and thus females with hydrated ovaries are common just before peak spawning activity which begins about 2200 in the nocturnally-spawning anchovy.

The mean fraction of females with hydrated ovaries occurring in trawls taken between 1900 and 2159 hours was calculated for each survey, as was the fraction of trawls taken in this interval in which one or more of the females had hydrated ovaries (the latter statistic is somewhat less variable than the former because it is less dependent upon the number of females in the sample, which varied widely among trawls).

From 1967-1977, female anchovy with hydrated ovaries were consistently taken in the CDF&G surveys conducted during the first 6 months of the year. On the average, 15% 4% (+ZxSE, N=18) of the females taken between 1900 and 2159 hours had hydrated ovaries. This value is similar to those derived from the histological evidence discussed previously. Similarly, 51% 10% of the trawls taken between 1900 and 2159 contained females with hydrated ovaries in CDF&G surveys conducted during the first 6 months of the year. Since the hydrated ovarian condition lasts less than 24 hours, these data indicate that for the last 15 years the average mature female anchovy has spawned about once a week during the peak months of the spawning season. This conclusion provides further documentation for the high frequency of spawning of the northern anchovy.

The analysis of CDF&G ovarian stages indicated that intense spawning of northern anchovy occasionally occurs during the second half of the year (July-December). Thirteen of the surveys conducted from 1966 to 1979 had 10 or more trawls taken between 1900 and 2159 hours and therefore met Hunter's criterion for analysis. In 8 of the 13 surveys, no females with hydrated eggs were taken; in 3 surveys minor reproductive activity occurred (2-8% of the females had hydrated eggs); and intense spawning occurred in 2 surveys. In August 1969 and September-October 1975, 15% of the females had hydrated eggs indicating an intensity of reproductive activity equivalent to the peak months of the usual season (January-April). Ichthyoplankton records for 1969 and 1975 also indicate an unusually high level of spawning occurred in late summer and fall of these years. Therefore, the CDF&G annual fall survey could be used to indicate whether or not significant fall spawning occurred in years for which no ichthyoplankton records are available.

Growth and Survival of Jack Mackerel Larvae Studied

As part of an ongoing study to evaluate factors which affect the survival of fish larvae in the sea, fishery biologist Gail Theilacker is determining the growth rate and the incidence of starvation-induced mortality of jack mackerel larvae collected from a 24-square mile area about 200 miles west of San Diego, California. Theilacker's study is addressing two main questions: 1) how significant is starvation as a source of larval mortality, and 2) does the density of larvae influence larval growth (i.e., is competition for food regulating growth)?

Last month Theilacker completed the histological examination of all larvae collected from a centrally-located station in which the larval density was high (more than 200 larvae were collected). She determined that 14% of these larvae were starving; because larvae may show starving signs for as long as 4 days, she estimated that the daily mortality due to starvation at this

station was about 3.5% per day. Thus at this station, where the density of larvae was high, starvation does not appear to be a major cause of mortality in larval jack mackerel.

Larval growth rates can also be used as an indicator of larval condition. If larvae are competing for food in areas where the density of larvae is high, the condition of some larvae may be poor and thus average growth rates would be slower than expected. In order to determine whether the density of larvae in a given area influences larval growth rates, Theilacker, with the help of Tom Bosy, student from Southhampton College, estimated larval growth rates by counting daily growth increments in the otoliths from larvae collected in the study area.

Within the 24-square mile sample area, a larval density gradient was apparent: densities ranged from 100-300 larvae per sample in the northeast quadrant to about 0-45 per sample in the remaining area. Larvae were grouped by sample density (high or low), and the average growth rates were compared by using an analysis of covariance. Growth of larval jack mackerel is known to be curvilinear, but Theilacker assumed, for the analysis of covariance, that growth was linear (the range in size/age of larvae collected in these samples was very limited).

Larvae used in the growth analysis were collected in standard Bongo haul samples which were preserved in alcohol. In order to obtain quantifiable samples, Bongo nets are thoroughly washed before preservation. This abrasion damages the larvae, causing loss of eyes and otoliths. Thus the number of larvae that could be aged was small. A total of 221 larvae were aged, 61 taken from low-density samples and 160 from high-density samples. The growth rate for larvae collected in low-density areas was 0.166 mm/day and 0.147 mm/day for high-density areas. Theilacker does not have sufficient data to reject the null hypothesis that the daily growth rates are equal ($p=0.20$); however, the average size of each group at an average age is different ($p=0.003$), indicating that even though the growth rates are equal, the elevations of the growth curves are not equal. But this difference in size at a common age was only 3%, 0.1 mm, and a difference of this magnitude cannot be measured using available techniques. Thus, Theilacker concluded that growth rates of jack mackerel larvae in the sample area were not density-dependent.

Plankton from CalVET Samples Analyzed

This month fishery biologist Dr. Angeles Alvarino continued to analyze CalVET plankton samples collected off the California coast by the NOAA research vessel, David Starr Jordan, during cruise 8104 in April 1981. This was the third of four surveys conducted to gather the data needed to estimate the anchovy biomass based on the larva census method. CalVET samples were taken for the replicate survey for the egg production method of biomass estimation. Alvarino chose plankton samples from collecting stations which would help determine the source, extension, and southward extinction of planktonic populations encountered within the study area. Additional samples are being analyzed to identify better the biotic environment that anchovy prefer for spawning, and the biological conditions present in the areas with the highest indices of anchovy larval survival.

SURVEY SYSTEMS DEVELOPMENT AND EVALUATION

Center Develops Tools for Possible Management of Global Fish Yield

Dr. Paul E. Smith, Leader of the Survey Task, estimates that one-third of the world's fish yield could be managed using plans and techniques devised by biologists at the Southwest Fisheries Center's Coastal Fisheries Resources Division. According to Smith, the combined use of the philosophy of the anchovy management plan and the Center's egg production method could be applied to anchovies, sardines and in all likelihood sprat and other coastal pelagic fishes. The yield of coastal pelagic fishes fluctuates greatly because of their life history, the variable environments they inhabit, and the unrestrained fisheries which are commonly conducted on these fishes. Other large fisheries on oceanic fishes are more stable.

"Growth overfishing," where the fish products become too small for the market, is chronic and easily detectable from monitoring the commercial fishery. The coastal pelagic fisheries occasionally experience severe "recruitment overfishing" which is undetectable by conventional means. The severity of this type of population/environment/fishery event has been typified by the collapse of the Japanese and California sardine in past decades and the Peruvian anchovetta and South African sardine in the last decade (Figure 1). Increased effort on the alternate schooling coastal pelagic fishes may well trigger "recruitment overfishing" on the remaining stocks.

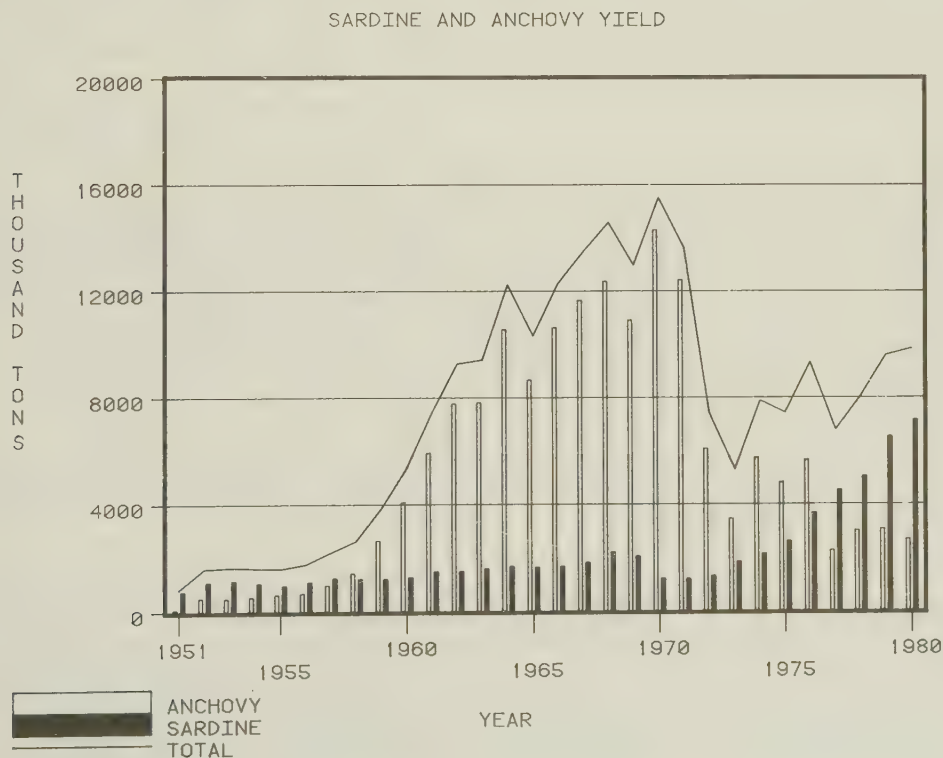


Figure 1. Sardine and anchovy fishery yields from 1951 to 1980.

ECOLOGY AND TAXONOMY OF FISHES OF THE CALIFORNIA CURRENT

Cooperative Research Conducted with Japanese Scientists

Dr. Geoff Moser, Program Leader, recently returned from a 2-month research stay at the Ocean Research Institute (ORI), University of Tokyo, Japan, where he collaborated with Dr. Koichi Kawaguchi on several projects. Most of the time was spent examining fish larvae from discrete vertical samples taken on a transect across the Kuroshio Current. Over 7,000 larvae from all major fish groups were examined and identified and preliminary analysis shows that the Kuroshio produces marked changes in the vertical distribution of fish larvae.

Another cooperative project was a study of the early life history of stomiatoid fishes. A description of the early life history of Tactostoma macropus, a predatory fish found in the mid-waters of the north Pacific, was begun. Drs. Kawaguchi and Moser also worked on their review of the early life history of stomiatoid fishes for the Ahlstrom Memorial Symposium which will be held in La Jolla in August 1983 (additional information about the symposium is given in the following article).

In addition, Moser held extensive discussions with Dr. Muneo Okiyama of ORI on the early life history of myctophiform fishes, a group which Dr. Okiyama will review for the upcoming symposium. Time was also spent with Dr. Kunio Amaoka of Hokkaido University on a cooperative study designed to complete the work done by Dr. Ahlstrom on the early life history and systematics of flatfishes; results of the study will be presented at the symposium.

Preparation for Ahlstrom Memorial Symposium Continues

The steering committee for the Ahlstrom Memorial Symposium on Ontogeny and Systematics met at the Gulf Coast Research Laboratory, Ocean Springs, Mississippi, February 24-27, to make final plans for the symposium to be held in La Jolla, California, in August 1983. Committee members include Dr. Geoff Moser, Fishery Biologist at the La Jolla Laboratory, as Chairman, Drs. Daniel Cohen and Arthur Kendall (Northwest and Alaska Fisheries Center, NMFS), Michael Fahay (Northeast Fisheries Center, NMFS), Dr. William Richards (Southwest Fisheries Center, NMFS), and Dr. Sally Richardson (Gulf Coast Research Laboratory). Following the meeting, a memorandum describing the details of the symposium and a revised schedule were mailed to all contributors.

The symposium will begin with two major papers, one reviewing the relationship of early life history stages to fish systematics and to fisheries, and the other the current concepts in fish systematics, with an assessment of the role of early life history stages in fish systematics. This will be followed by a paper defining ontogenetic stages and an extensive poster session addressing techniques and approaches used in this field. Three

days will be devoted to a review of the systematics of major fish groups with particular attention being given to early life history stages and their utility in assessing phylogenetic relationships. Dr. Richardson will present a concluding paper. The symposium will result in a book that will be a compendium and guidebook for larval fish identification and an up-to-date treatise on early life history characters and their use in understanding the evolutionary relationships of fishes.

Paper Describes Early Life History of California and Baja California Croakers

This month all members of the taxonomy staff worked on the distribution section of a paper that will describe the early life history stages of seven species of croakers. Included are the white croaker, white sea bass, queenfish, black croaker, corbina, spotfin croaker and yellowfin croaker. Larval and juvenile specimens for the species descriptions were obtained over the past several years by rearing eggs from nearshore plankton collections and from aquarium spawnings. The white sea bass series is being augmented by specimens provided by fishery biologists Roderick (Roger) Leong and Carol Kimbrell of the Population Biology of Fishes Program, who are presently rearing a large batch of white sea bass from an induced spawning (for more details on this event, please see the first article in the Coastal Fisheries Resources Division section, this issue). Illustration of developmental stages of the seven croaker species have almost been completed by fishery biologist Barbara MacCall, and the descriptive accounts are being prepared. The distributional and seasonal abundance section will be completed this summer and the paper itself will be completed for submission to next year's CalCOFI Reports.

Samples from Anchovy Egg Production Cruise 8202 Processed

Program leader Dr. Geoff Moser reports that the staging of anchovy eggs from egg production cruise 8202 was completed in March and that the eggs and larvae of other species were identified during April. Data on the distribution and relative abundance of eggs and larvae of species other than anchovy are being accumulated from all anchovy egg production cruises for a fine-scale distribution study of these species.

COASTAL EASTERN PACIFIC FISHERIES ENVIRONMENT INVESTIGATIONS

Report on Exploratory Albacore Longline Fishing Completed

Dr. R. Michael Laurs, Leader of the Fisheries Environment Investigations Program, oceanographers Ronald Lynn and Ken Bliss, and fishery biologists Ronald Dotson, Robert Nishimoto, and David Holts have completed a comprehensive analysis and report on the recent exploratory longline survey

for albacore. The report, entitled "Exploratory albacore longline fishing in the eastern North Pacific during winter 1982" will be issued as SWFC Admin. Rep. LJ-82-06. The survey was conducted cooperatively by the National Marine Fisheries Service, Southwest Fisheries Center (SWFC) in La Jolla, California, and the U.S. albacore fishing industry's American Fishermen's Research Foundation (AFRF).

The purpose of the survey study was to evaluate the potential for establishing a U.S. fishery on North Pacific albacore during winter months in eastern North Pacific waters. The U.S. albacore fishery has traditionally operated during summer and fall months, usually within a few hundred miles of the North American coast. In some years it extends as far south as central Baja California, Mexico, and in some years as far north as northern British Columbia, Canada. In recent years, U.S. fishermen have also begun to fish for albacore from near the international dateline and eastward during early spring and summer months.

Saltonstall-Kennedy funds managed by the NMFS Southwest Regional Office in Terminal Island, California, and awarded to the AFRF were used to charter fishing vessels and finance other costs. The operational aspects of the study were carried on by the AFRF and managed by the Western Fishboat Owner's Association (WFOA), a west coast association of albacore fishermen. Fishery scientists at the SWFC planned the study and worked with the AFRF and WFOA to organize it. In addition, the SWFC provided scientific equipment and personnel: Dotson, Holts, and biological technician Dmitry Abramenkoff were aboard three of the chartered fishing vessels to make scientific observations and to keep detailed records related to the fishing operations and catch.

This was the second Saltonstall-Kennedy grant awarded to the AFRF for studies of exploratory longlining fishing operations. The first study, conducted cooperatively with the SWFC in January-February 1981, investigated the possibilities of expanding the U.S. albacore fishery to operate outside the traditional spring and summer seasons using longline fishing methods. The results of the first study showed that it was feasible for U.S. fishing vessels in the 50- to 80-foot size class to longline for albacore during the winter months. A limited quantity of gear was deployed with subsequent small catches in 1981; however, the catch rates were sufficiently high to suggest that a profitable winter albacore fishery could be developed.

The second study was designed to expand upon the 1981 findings. The amount of gear deployed was increased to reflect potential commercial efforts and a fishing strategy was proposed based upon associations of catch and subsurface thermal structure found in the first survey. The objectives of the second study were to: 1) conduct exploratory fishing using longline fishing methods to determine if sufficient catches of albacore can be made to support an expansion of the U.S. fishery, 2) make scientific observations to determine oceanographic conditions that may influence albacore distribution and catchability in the area, and 3) collect scientific data for albacore biology and fishery studies.

During January-February 1982, the six commercial fishing vessels chartered by the AFRF conducted exploratory longlining operations for albacore

in an area centered about 1000-1500 miles west of San Diego, California. A combined total of 112 sets were made on the survey. Each of the vessels typically set 800 to 1400 hooks in and about thermocline depths of 350 to 700 feet. A total of 70,939 pounds of albacore and 7,834 pounds of bigeye tuna was caught. Seven percent of the total albacore landings were fish taken on trolling gear. Individually the vessel landings ranged from 24,274 to 6,102 pounds of albacore and bigeye combined. Daily longline catches ranged from 0 to 136 albacore. The mean catch per set for all vessels was 31 albacore, equivalent to 3.2 fish per 100 hooks (3.4 if bigeye tuna are included). The average hook rate varied among vessels from 1.6 to 4.8 per 100 hooks. There was some fish loss due to line twisting, part of which occurred as the gear broke surface. This problem varied among vessels and can be largely reduced by modifications in gear and handling. The longline catches fell into two size groups, 14 to 18 pounds and 22 to 27 pounds.

Thirty-five days were allocated to each charter vessel; of these, 12 to 13 days were used in transit during which the vessels trolled for albacore. Of the 22-23 days on the longline fishing grounds, 3 to 4 were lost to rough weather, except for the one vessel which could operate. One vessel conducted acoustic tracking experiments for 4 days and another spent an additional 4 days trolling.

A summary of the fishing results from the 1982 Albacore Longline Project is presented as Table 1. These results show that the U.S. albacore fishery can be extended to operate during winter months using longline fishing operations in an area where the fleet has not traditionally fished. This potential for a mid-winter fishery exists as an important alternative to other winter fisheries or remaining idle. An additional factor of importance is that fuel consumption was 40 to 50% below that typical of trolling operations.

Table 1. Summary of Fishing Results from 1982 Albacore Longline Project

Vessel	No. of Sets	Range of Hooks/Set	Range No. Alb./Set	Avg. Alb./ 100 Hooks	Total No. Alb.	Total No. BE	Total Wt.** Alb. (lbs.)	Total Wt. BE (lbs.)	BE as % Total Wt.
<u>Alaska</u>	20	288-1050	1-136	3.5	587	17	10583*	817*	10*
<u>Arrow</u>	20	720-1400	8-110	4.8	1144	38	22564	1710	7
<u>P. Pioneer</u>	20	480-1050	1-76	2.8	505	58	13310	2140	14
<u>Sea World</u>	13	382-1059	0-49	2.7	276	9	7060	404	5
<u>Taasinge</u>	23	282-1684	2-84	2.8	695	35	12400*	1683*	10*
<u>Temptation</u>	16	229-1040	0-35	1.6	211	24	5022*	1080*	18*
Totals	112	---	---	---	3418	179	70939	7834	

*Albacore and bigeye were weighed together. Weights for each species were estimated from the numbers of each caught and their average weights.

**Weights of albacore include troll caught fish which account for 7% of catch.

The following are some highlights of the scientific findings from the survey:

1. Two acoustically-tagged albacore were tracked, one for 14 hours and the other for 24.5 hours. Each was found to move through a small range in depth in the upper thermocline during daylight and a larger range in the lower half of the surface mixed layer during darkness.
2. An analysis of the longline gear and tests of its settling depth showed that the major fishing effort occurred between 90 and 200 meters (300 to 700 feet). When related to thermal structure, the catches were found to fall within the upper levels of the thermocline (Figure 1).

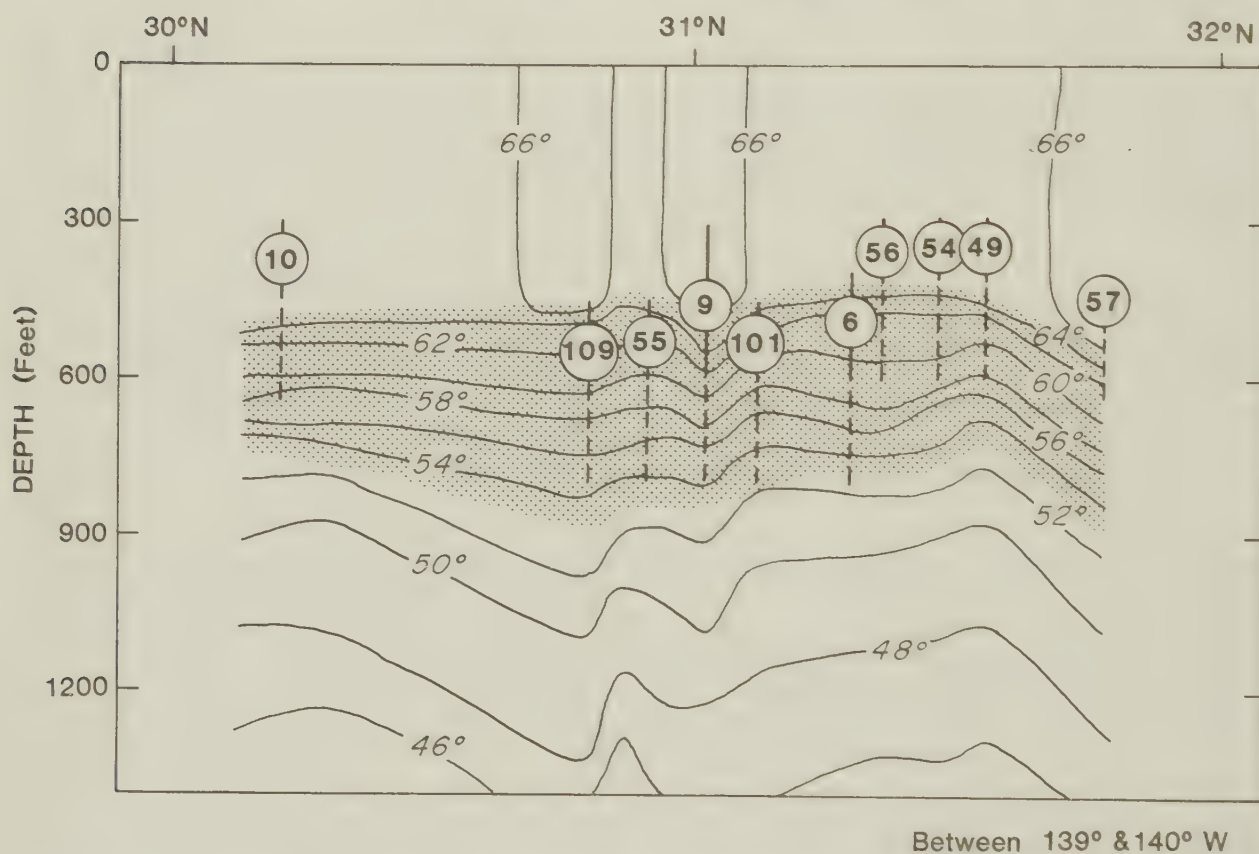


Figure 1. Example of longline catches of albacore tuna by the chartered fishing vessels, Taasinge and Arrow, plotted on an isotherm section. Number of fish caught is circled. Solid vertical line depicts buoy length; dotted vertical line indicates potential fishing depths, assuming a line sag of 200 feet below buoy-line depth. Shaded area indicates the sharpest thermal gradient of the thermocline.

3. The catch, analyzed by hook (on three vessels) and by basket (the grouping of hooks between floats), reveals a variation in the manner of distribution. In some sets the albacore were evenly distributed; in

others they were clumped. This analysis also shows that catches tended to be greater nearer the float lines than in the center of each basket.

4. There was a significant disparity among the catch rates of the six fishing vessels. The catch rates ranged from 1.6 to 4.8 fish per 100 hooks. While the reasons for this disparity are not fully understood, the differences in gear, operations, and bait handling are raised as the probable causes.

5. The occasional loss of fish and tangling of gear is traced to design of the gangions (the short lines with leader and hook that is clipped to the main line) and to line tension during retrieval.

6. The albacore catch rates compared favorably with recent Japanese longline catch rates.

The report concludes with a list of recommendations for the choice and design of gear and operating procedures. The authors express the need for additional studies, including: the influence of undersea topographic features upon catches; variations in catches by season, area, and changing oceanographic conditions; the effect of artificial lures upon catches; and the economics of longline fishing versus alternate uses of an albacore vessel during the winter season.

Lt. Hennick Assigned to Fisheries Environment Investigations Program

Lt. Douglas Hennick, NOAA Corps Officer, has been assigned to work with the Fisheries Environment Investigations from April until September 1982, at which time he will enter Scripps Institution of Oceanography as a graduate student in the marine biology program. Under the guidance of oceanographer Ron Lynn, Hennick is evaluating the oxygen trace from 1978 CalCOFI cruises recorded from the Beckman oxygen probe on the CTD profiles. There is a sizable and variable offset in the oxygen measurements made by the probe as compared to the standard Nansen bottle samples. However, these oxygen profiles contain a notable degree of detail that cannot be derived from the bottle data. If these profiles can be corrected to within a reasonable degree of precision, they will be a useful tool in the analysis of water masses.

Microcomputer Modified to Act as Terminal

A terminal emulator software package, developed by Hewlett Packard, has been successfully modified by Ken Bliss, Oceanographer, to allow the HP9825 desk top computer to emulate a terminal and communicate with the VAX and Burroughs computer systems at the University of California, San Diego. The HP9825, which is normally dedicated to collection of salinity, temperature, and depth (STD) data at sea, can now extend its processing capabilities through its link to a mainframe computer.

The HP9825 is connected to an Inmac telephone modem via an HP98036 serial I/O interface card. Input/Output communication between the HP9825 and the mainframe computer occurs at 300 baud rate and data are displayed on an HP9871 serial impact printer.

Future use of the "terminal" will involve the transfer of STD data, stored on HP compatible cassette tapes, to the VAX, initiate processing and plotting programs on the VAX, and transfer the processed data back to the HP9825 for display.

COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT

Anchovy Egg Production Rate Calculated

This month statistician Susan Picquelle analyzed the anchovy data set, provided by CalCOFI data manager Rich Charter, from cruise 8202 to calculate the egg production rate for the anchovy biomass estimate. Picquelle used post-stratification to separate the survey into two strata: stratum 0 is beyond the range of anchovy eggs, and stratum 1 is within the range and contains all the positive tows. This stratification greatly reduces the variance of the abundance estimates, and allows closer examination of the stations within the range of the population.

Picquelle examined the positive strata for "lurking variables" - unknown factors that may affect the abundance estimates, but were not controlled for in the survey design. Two such variables were identified: geographic region and time of day of the tow. Picquelle decided to estimate the biomass separately for the central California coastal region because few positive tows were made there, and those that were positive exhibited a very different age distribution from the rest of the survey. Fishery biologist Dr. John Hunter noted that the mature females taken from this area exhibited a markedly different fecundity rate than the rest, a factor which violates one of the assumptions of the biomass model, i.e., that all parameters are constant over the range of the survey in time and space.

Picquelle noted that egg abundances varied according to time of day, peaking at 2000-0800 and reaching a low at 0800-2000. By chance, the 12-hour interval used to estimate the mortality function (0200-1400, 1400-0200) completely masks this effect. Picquelle discovered that this cyclical pattern was due solely to a run of very large tows off Mexico taken between 2000 and 0800. Because this was not a pattern that existed throughout the survey, and because the 12-hour interval used to estimate abundance effectively balances out these large tows, Picquelle concluded that the time-of-day effect could be dismissed.

Picquelle then examined the growth model used to assign ages to the eggs based upon developmental stage and water temperature; this model was developed

by Hunter and James Zweifel, Statistician at the NMFS Southeast Fisheries Center, for research in the laboratory using eggs from females artificially induced to spawn. Concluding that the eggs from the 8202 survey had been aged properly, Picquelle estimated the mean abundances for the five 12-hour intervals from 0200 in the morning after spawning occurs (assumed to be at 2200) to 1400 of the second day after spawning, when hatching occurs. The positive stratum was further separated into two smaller strata based upon the different sampling intensities in the two areas. The mortality model was fit to the five estimated abundances, achieving a much tighter fit than either of the two 1981 surveys. The mortality rate was estimated to be 0.178 (rates for cruises 8102, 8104, and 8003 were 0.127, 0.0, and 0.377, respectively). The estimated egg production parameter will not be reported until after the NMFS Southwest Regional Office announces the biomass estimate in June.

Anchovy Birthdate Distribution Examined

Fishery biologist Dr. Rick Methot has completed a draft of a manuscript entitled "Seasonal variation in survival of larval Engraulis mordax estimated from the age distribution of juveniles." This study was based upon an analysis of daily increments in otoliths of juvenile anchovy collected during fall 1978 and fall 1979. A similar analysis for the 1980 year-class was recently completed by fishery biologist John Butler and Susan Longinotti, contractor from the University of California, San Diego. Analysis of the 1981 year-class is currently underway.

Methot and Butler are comparing the relations between size and birthdate in 1978, 1979, and 1980 to determine if it is reasonable to develop a combined size-birthdate nomogram (key) which could be used to estimate the birthdate distribution of past year-classes from their size distribution. The birthdate distributions will be compared to seasonal patterns of larval abundance to search for further evidence of seasonal variation in larvae-to-juvenile survival. So far Methot and Butler have found little alongshore variation in growth within each year but there is evidence that growth was faster in 1980. From a second order polynomial regression of size on birthdate they obtained the following estimates:

		Length (mm)			
		1978	1979	1980	combined
Birthdate:	Jan 1	96.7	90.6	97.9	94.7
	Mar 1	83.9	83.1	89.9	86.3
	May 1	70.4	72.8	77.5	74.6

Methot has written a FORTRAN program to estimate the size-birthdate nomograms from the regression parameters. Variation in birthdate distribution resulting from application of the several nomograms to the same size distribution will be determined before using the combined nomogram on historical size distributions.

Paper on Optimum Fishery Quota Strategies Presented

This month Dr. Daniel Huppert, Industry Economist and Program Leader, presented a draft paper on optimum fishery quotas to the Department of Economics, University of California at San Diego. Written during February-March, the paper examines the implications of market price uncertainty for quota policy. Earlier papers have developed optimum feedback control strategies that essentially define optimum yield as a function of stock abundance. Random variations in year-to-year stock growth were found to necessitate the adoption of a feedback control (or harvest strategy) assuring probabilistic convergence on an optimum yield and stock (Roy Mendelssohn, Operations Research Analyst at the Pacific Environmental Group, SWFC, has explored this type of problem rather extensively). The new wrinkle introduced in the current paper is the existence of price uncertainty at the time of quota-setting compiled with industry adaptation to realized market price. The most important effect of price-setting after quota-setting is that the industry may choose to harvest less than the quota. Huppert shows that the optimum quota and optimum catch are not the same under these conditions. The optimum quota is generally greater than the catch rate that maximizes expected economic return.

Paper on Fishing Vessel Economic Performance Presented

Industry economist Cindy Thomson has completed analysis of seven published papers which evaluate the economic performance of a particular commercial fishing fleet in order to identify the state of the art in cost analysis of this type and to suggest areas in which improvements could be made. She presented her observations in a draft paper entitled "A review and evaluation of some fishing vessel economic performance studies," at the Fisheries Economists meeting held in La Jolla, California, on March 31.

Thomson's major conclusions were that: 1) accounting concepts of cost are frequently utilized in studies of this type because accounting data are readily available; and 2) economic costs which do not appear on the vessel owner's books are often not recognized, making it difficult to measure economically meaningful alternatives.

Dissertation Research on Southern California Pelagic Fishery Nearing Completion

Mike Phillips, economics graduate student at the University of California, San Diego, and student employee at the La Jolla Laboratory, is completing his dissertation study of the multispecies southern California purse seine fleet. Three chapters drafted so far include 1) a historical/descriptive account of the San Pedro purse seine fishery focusing on the organizational elements and relationships within the industry; 2) a mathematical economic model of daily fishing activity in the multispecies context and emphasizing the role of daily cannery orders and fisherman's response to uncertainty; and 3) an annually aggregated model of the industry

to study bioeconomic interactions, the role of monopsony power, and the presence of non-market values in the optimal use and regulation of the fishery. Phillips also plans to complete a statistical analysis of the fishery using landings data available in the Coastwide Summary Data Base at the Southwest Fisheries Center.

Fishmeal Data Base Finalized

This month industry economist Cindy Thomson made final modifications and additions to the fishmeal data base, including calculation of a revised poultry index. This data base includes monthly data from January 1964 through November 1980 on fishmeal production and imports; fishmeal, cornmeal, and soybean meal prices; a weighted average of fish oil prices; diesel and natural gas prices; a poultry index and the variables used in its construction; and composite measures of fishmeal supplies and prices. All files are fully documented and available on the VAX computer system.

Most of the variables on file were graphed (using Easygraphing on the Burroughs 7800 computer system) to determine the presence of seasonal patterns and trends. Supply and demand equations were estimated using various forms and various lag structures on the independent variables. Several attempts at estimation also involved the use of de-seasonalized rather than raw data. The results are currently being written up as an administrative report.

Oceanic Fisheries Resources Division

MARINE MAMMAL BIOLOGY PROGRAM

SWFC Scientist to Visit Soviet Institute

The Academy of Sciences of the U.S.S.R. has invited Dr. William F. Perrin, Leader of the Marine Mammal Biology Program, to visit the N.K. Koltzov Institute of Developmental Biology in Moscow for 2 weeks, as a guest of the Academy. Perrin will work jointly with Prof. Alexey V. Yablokov (who visited the Center this year) and Dr. M. Mina on the use of non-metrical characters in the definition of populations and subpopulations of pelagic dolphins. A very large series of osteological specimens of the common dolphin, Delphinus delphis, from the Black Sea exists in the museum of Moscow State University. Perrin will also deliver several lectures during his visit.

Coastal Marine Mammal Cruise Completed

This month scientists from the Marine Mammal Biology Program spent 3 weeks conducting line transects to assess densities of cetaceans in the Los Angeles Bight. The major objectives of the cruise (No. 154), conducted April

5-22 aboard the NOAA research vessel, David Starr Jordan, were to: 1) develop and test technology to improve accuracy of sighting angles and distances of marine mammal schools from ships (Figure 1); 2) calibrate marine mammal density estimates from vessels with estimates from aircraft; and 3) to survey 14 track lines covering the southern California Bight which had previously been surveyed from 1975-1978 by the University of California at Santa Cruz personnel under a contract from the Bureau of Land Management. Progress was made in the development of the new system to determine distance off the trackline, but additional field tests will be necessary before a final evaluation is made. These tests will take place before the marine mammal survey scheduled in the eastern tropical Pacific Ocean in May-July (Jordan cruise No. 155).

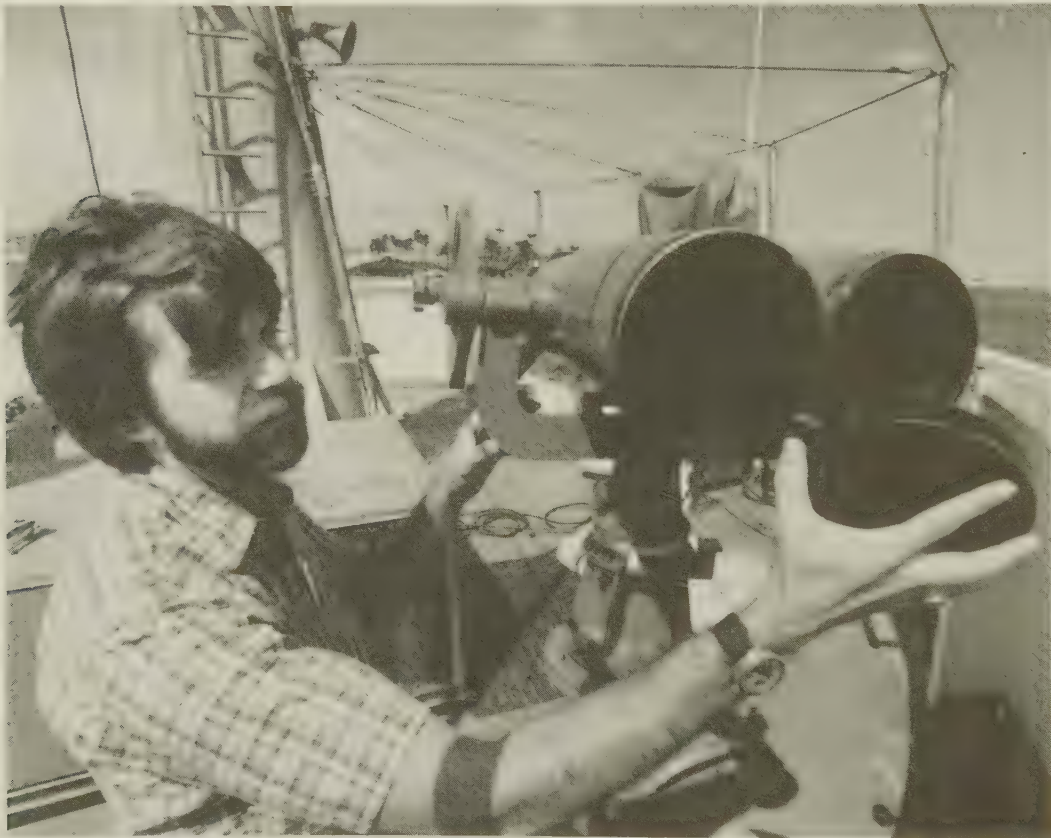


Figure 1. Dr. Rennie Holt, Operations Research Analyst, removes a lens cap from binoculars used by SWFC scientists aboard the R/V David Starr Jordan to sight marine mammals at sea. (Photo courtesy of the Union-Tribune Publishing Company.)

According to Dr. Rennie S. Holt, Operations Research Analyst, the data needed to calibrate sightings from vessels with those from aircraft have been collected. Fishery biologist Chuck Oliver directed aircraft activities, assisted by biological technicians Larry Hansen and Bill Brinkerhoff. Research activities aboard the Jordan were performed by wildlife biologist Dr.

Douglas DeMaster, operations research analyst Dr. Jay Barlow, biological technicians Lisa Ferm and Mark Lowry, Robert Cowan (Scripps Institution of Oceanography), Sandra Hawes (San Diego State University), and Michael Scott (Inter-American Tropical Tuna Commission). Scott trained the other participants in species identification.

During the 17-day track line survey, 88 cetacean schools were sighted, 70 of which were dolphin and porpoise schools. The species most frequently seen were: common dolphins, Delphinus delphis (16 schools), Dall's porpoise, Phocoenoides dalli (16 schools), Risso's dolphins, Grampus griseus (12 schools), and northern right whale dolphins, Lissodelphis borealis (10 schools). School-size estimates are currently being analyzed. Fourteen different species of cetaceans were observed; five of these were seen riding the Jordan's bow. Only three sightings of short-finned pilot whales, Globicephala macrorhynchus, were made - all in mixed schools with bottlenose dolphins, Tursiops truncatus, and all around Catalina Island off the California coast. In addition to the survey work, environmental data on water temperature, salinity, and chlorophyll concentration were collected for correlation with marine mammal sightings. Six mid-water trawl hauls were also made to collect prey species of sea lions. This material is being used to facilitate better identification of the food contents in California sea lions feces and spewings collected at the rookeries.

Preparations Made for Cooperative Pilot Whale Tracking Study

Jacqueline G. Jennings, Fishery Biologist, has been completing preparations for a pilot whale tracking study in the vicinity of Catalina Island, California. She assisted the staff of the Hubbs-Sea World Research Institute in the design of a new saddle to attach the satellite-linked transmitter to the whale. Jennings has used the system, designed and built by HANDAR, for tracking dolphins off Hawaii last summer (details of the system are given in the June 1981 issue of the SWFC Monthly Report, pages 19-23). Hank Fallek of HANDAR was brought to San Diego to modify the receiver for use with pilot whales and to install the electronics in the airplane which will be used during the tracking project. Jim Squire, Fishery Biologist at the La Jolla Laboratory, served as test pilot during the check-out flights. During these trials, the tracking equipment performed well but the transmitter malfunctioned. Fallek identified defective batteries in the unit and replacements were ordered from the manufacturer. Jennings expects to receive these units by the beginning of May.

The satellite tracking station at El Paso, Texas, which will receive the transmissions sent during the project, has been out-of-operation due to repairs. The station resumed operation at the end of April so the experiment may begin as soon as a pilot whale is captured.

Work Proceeds on Age Determination of Spotted Dolphins

During April, data and specimen verification procedures were undertaken by Dr. Al Myrick, Leader of the Marine Mammal Age Determination Project, and zoologist Aleta Hohn, for the 1600 northern offshore spotted dolphin (Stenella

attenuata) samples being studied as part of the project. One of four subsamples has been completed. The data base for this subsample will be available during early May for a "precision analysis," designed by Dr. Steve Reilly, Operations Research Analyst with the Marine Mammal Monitoring and Assessment Program, in cooperation with Myrick and Hohn. Biological technicians Makoto Kimura, Priscilla Sloan, and Drew Stanley are continuing to work on the remainder of the sample.

* * * * *

Rebecca Hankins, Computer Assistant, has joined the Age Determination Project as a data editor. She is assisting zoologist Aleta Hohn with comprehensive editing of the Tooth Reading Record data bases. Hankins' first task is to assist in correcting errors in the completed subsample data base.

Harbor Seals Radio-Tagged for Study

This month wildlife biologist Dr. Douglas DeMaster participated in capturing and radio-tagging harbor seals on the Columbia River. He spent 3 days with Robert DeLong of the NMFS Northwest and Alaska Fisheries Center (NWAFC) and Rocky Beach of the Washington State Department of Game, in an effort to standardize techniques used to study harbor seals in the Columbia River and Oregon/Washington coast. The Columbia River project is supervised by Beach, with funds from a contract with the NWAFC. DeMaster worked with Beach and DeLong in analyzing census data, and was shown recent inventions in radio-tagging packages by Steve Jeffries and food habits analyses by Steve Treacy, both of the NWAFC.

MARINE MAMMAL MONITORING AND ASSESSMENT PROGRAM

Biweekly Monitoring of 1982 Porpoise Mortality Begins

Computer Programmer Ken Wallace has modified the update computer program to accept 1982 data for the mortality monitoring trip data base, which contains departure and arrival dates of all trips certificated to fish "on porpoise" and mortalities of porpoise by stock, as reported by radio from vessels with observers. The first estimate for 1982, using this new program, was produced by biological technician Bob Franco and biological statistician Bruce Wahlen in April. Total estimated cumulative mortality for all porpoise stocks with a non-zero quota for 1982 through April 25, is approximately 8700; 42% of the 20,500 animal annual quota has been reached within the first third of this calendar year. This 4-month porpoise mortality of 8700 is nearly three times the mortality level attained during a comparable period in 1981. For vessels with observers aboard, the average number of dolphins killed-per-days-fishing has nearly doubled over last year's rate at this time, but the numbers killed per set and per ton appear to be lower.

Annual Revision to Porpoise Editing Programs Completed

The scope or format of data recorded by NMFS observers aboard U.S. purse seine fishing trips can change annually. When such changes occur, a series of adjustments must be made to the several pieces of software which process these data. These pieces include software which 1) edits the data, checking for variable values outside their expected range and other potential errors; 2) provides a description of the data in computer language; and 3) loads the data from punched cards into the computer data base. Biological technician Bob Franco and computer programmer Ken Wallace have completed the necessary adjustments to this series of software pieces to accommodate data recorded in the 1982 format. With the completion of these software adjustments, data from the first 1982 NMFS observer trips have been edited and loaded into the 1982 data bases.

Major Software Package Documented

EDS contract programmer Celia Jacobs has completed a draft version of a "User's Guide to Common Subroutines." This catalog provides functional descriptions for 39 FORTRAN subroutines which are commonly used in programming applications of the Marine Mammal Monitoring and Assessment Program. Some of the functions performed by these subroutines are: 1) formatting the output of data of editing programs, 2) checking for the presence of blanks within a character string, 3) checking that a variable assumes values within a specified range, and 4) determining whether a given position lies within a specified polygon.

TUNA/BILLFISH RESOURCES PROGRAM

1982 Billfish Newsletter Released

Fishery biologist Jim Squire reports that the 1982 Billfish Newsletter is now being distributed to anglers who participated in either the Billfish Tagging Program or the annual Pacific International Billfish Angler Survey. Results of the 1981 tagging program and the 1980 billfish survey are covered in the Newsletter. Billfish anglers participating in the survey reported catching 3,351 striped marlin, 1,130 sailfish, 677 black marlin, and 663 blue marlin. The overall Pacific billfish catch rate was 0.4 billfish per angler day, or 2.5 days of fishing per billfish caught. This was an increase from 1979 catch rates but was well below the rates observed in the early 1970's.

Included with the Billfish Newsletter is the angler survey form for recording 1981 catch-and-effort data. These forms are also being distributed to billfish clubs and anglers by the International Game Fish Association.

1982 Albacore Fishery Sampling Planned

Dr. Gary Sakagawa, Division Chief, fishery biologist Dr. Norm Bartoo, oceanographer Dr. Mike Laurs, and mathematician Al Coan have contributed to

the final sampling scheme for the 1982 U.S. Pacific albacore fishery. On April 8, they met with the albacore statistical committee of the Pacific Fishery Management Council to determine the amount and distribution of effort required to sample catch-and-effort and size composition of fish taken in the U.S. fishery adequately. Logbook records are to be collected and fish measured at major landing ports in Washington, Oregon, and California throughout the summer-fall fishing season.

Paper Accepted for "OCEANS 82" Conference

A paper, entitled "Geomagnetic orientation by pelagic fish," has been accepted for presentation at "OCEANS 82," a conference sponsored by the Marine Technology Society and Institute of Electrical and Electronic Engineers. The authors, fishery biologist Dr. Andrew Dizon of the La Jolla Laboratory, Michael Walker (Honolulu Laboratory, SWFC, and University of Hawaii), and Dr. Joseph Kirschvink (California Institute of Technology) make a case for the use of magnetic information as cues for directing movements by pelagic animals.

TIBURON LABORATORY

FISHERIES DEVELOPMENT INVESTIGATION

JORDAN Cruise Produces Fish for Market Analyses

Fisheries Development Task leader Sus Kato reports that exploratory fishing trials off the central California coast from March 31 through April 4 produced good catches of sanddabs, rex sole, English sole, and a few Dover sole. Kato was assisted during the fishing trials aboard the NOAA research vessel, David Starr Jordan, by fishery biologists Bill Leet and Sennen Salapare. The fish, caught between Monterey and Point Sur, California, were packed and frozen for market studies.

During the same voyage, four tows using a 1-meter plankton net were made in an effort to catch euphausiids. Two tows over Carmel Canyon verified an abundance of euphausiids at depths of 10-25 fm as indicated by marks in the echometer. Two tows over Monterey Canyon, where meter signs were generally lacking, yielded low euphausiid catches.

Potential for New Fishery Markets Explored

Fishery biologist Sus Kato traveled to southern California this month to meet with personnel from various segments of the fishing industry. He carried fish samples to a processing plant in Los Angeles which will attempt to produce dried or other processed fish products acceptable to the Japanese market. Several species of flatfishes were dried, and shortbelly rockfish was pickled in sake (wine) lees. Other products to be test-marketed in Japan are various species of frozen fish and the whelk, Kelletia kelletii. One Japanese firm wants to import a container load (20 tons) of whelk meat immediately, but the Tiburon Laboratory is unable to handle such a large order at present. The selling price is also undetermined because no one has experience in fishing or processing whelks. Fisheries Development Task staff members hope to do some test fishing to help fishermen establish a fair price. Samples of prepared, boiled, and frozen female squid (Loligo opalescens) brought immediate approbation, and may represent a viable export item. Cooked squid is exempt from import regulations in Japan, and the Japanese are partial to the eggs found in these spawning squid. Samples of basking shark meat were also obtained from a Santa Barbara processor and passed along to potential users.

In Los Angeles, Kato made arrangements with a fish-cake manufacturer to test several species of California fish for applicability in surimi. Task staff members plan to work with San Francisco and Monterey processors to provide test samples. It seems that the only surimi plant in the U.S. is experiencing difficulty in obtaining a steady supply of fish (Atlantic croaker) for their operations.

In Santa Barbara, Kato met with cooperating fishermen to learn the effectiveness of the Tiburon Laboratory's test beam trawl for small-boat fishing operations. The trawl apparently outfishes standard otter trawls used by others in the new sea cucumber fishery. The animals are boiled and dried, and exported to Hong Kong. Other fishing trials will be made in the future, with shrimp, spot prawn, and fish as the target catches.

It was clearly evident from numerous conversations with fishermen and processors from Monterey to Los Angeles that the industry is looking for new species to market, and that fishermen are anxious to try new gear as well as to experiment with fisheries for underutilized species. Task personnel hope to work with many of these individuals in the coming months.

FISH COMMUNITIES INVESTIGATION

Expansion of Cooperative Analysis of Rockfish Landings Planned

Since 1977, members of the Groundfish Analysis Task have combined forces with California Department of Fish and Game (CDF&G) personnel to collect and manage data from commercial and recreational rockfish landings in central and northern California. This month task leader Dr. William Lenarz and fishery biologist Candice Cooperrider met with CDF&G biologists Phil Swartzell and Dave Thomas, along with computer specialist Bernice Hammer, to discuss the future of these cooperative studies and how common goals can be met. It was decided that members of the Groundfish Analysis Task will edit and compile the sample data and supply a summarized quarterly report to CDF&G biologists participating in the project. Expanding the sample data to an estimated total catch by species, sex, length, and age group can only be accomplished if total landing values are supplied by CDF&G from market tickets. Time estimates for the retrieval of this information were discussed. With the exception of 1980, these values for the years 1978 to 1981 should be available within 1 year.

King Salmon Eat More Crab Megalopa in 1982

Peter Adams, Fishery Biologist with the Predator/Prey Task, reports that the number of crab megalopa found in the diet of king salmon has increased greatly in 1982 over previous years. The megalopa of crabs, *Cancer* spp., have been important prey of the king salmon (*Oncorhynchus tshawytscha*) between March and June during each of the 3 years that the Predator/Prey Task has studied this species. Adams, working with research assistant Connie Ryan of San Francisco State University, has found that the megalopa constituted about 34% of salmon diet during this period, compared to about 15% in 1980 and 1981. It has not yet been determined whether the large increase reflects exceptionally strong 1982 year-classes for these crabs.

Lenarz Chairs Discussion on Ocean Fisheries Management

Dr. William Lenarz, Leader of the Groundfish Analysis Task, chaired a session on Ocean Fisheries Management at the annual meeting of the Pacific Fishery Biologists held this month at Lake Tahoe, California. At the meeting he presented a paper on stock assessment of the widow rockfish, *Sebastes entomelas*. Industry economist Ed Ueber presented a paper entitled "Economist's review of data needs for groundfish management." Fishery biologists William Leet, Sennen Salapare, and Susan Smith also attended the meeting.

* * * * *

Peter Adams, Fishery Biologist with the Predator/Prey Task, participated in the first annual Pacific Coast Conference on Modeling Renewable Resources, held this month at Humboldt State University, Arcata, California. Several papers were presented which dealt directly or indirectly with the widow rockfish fishery.

PHYSIOLOGICAL ECOLOGY INVESTIGATION

First Draft of Report on Striped Bass Research Completed

Dr. Jeannette Whipple, Investigation Leader, has completed a first draft report on the striped bass research conducted at the Tiburon Laboratory, to be presented to the Office of Marine Pollution Assessment, California Department of Fish and Game, and California State Water Resources Control Board. The report, which includes a summary of all field research and data analyses done up to 1980 and some results from 1981, presents clear evidence of a relationship between petroleum hydrocarbons, particularly monocyclic aromatics (MAH), and egg and blood condition. There is also evidence of an effect of heavy metals on body and liver condition. The data indicate that 1) fish from the San Francisco Bay-Delta are in worse condition than those from Oregon, and 2) that within the Delta, fish from the San Joaquin River collection area are in worse condition than those from the Sacramento River. There is a clear effect of age and inherent factors on the condition of these fish, with older fish being in poorer condition. Color pattern striping breakage is also related to the uptake of MAH and other pollutants, indicating a possible genetic component to the effects of environmental pollutants.

In addition to the field results, the paper discusses the relative effects of benzene and zinc from experiments performed in an attempt to show the relationship of parasites and pollutants to one another; these laboratory experiments were designed initially to test observations of field fish but were adapted for the laboratory. The results of the experiments show a definite effect of parasites on the uptake of benzene and zinc, and indicate

an antagonistic relationship between zinc and MAH in terms of concentrations in the liver. The combination of zinc and MAH, however, eventually appears to result in deleterious effects on other physiological parameters, greater than those caused by either pollutant alone. There is also an apparent effect of benzene and zinc on the host reaction to parasitic worms, with those exposed having more worms than those not exposed, by the second week of exposure. In general, the laboratory experiments corroborated conclusions drawn from studies of fish caught in the field.

* * * * *

On April 27-28, Dr. David Nyquist of the Office of Marine Pollution Assessment, Boulder, Colorado, visited the members of the Physiological Ecology Investigation to discuss and review research done under funding from the Marine Sanctuaries Act. Dr. Jeannette Whipple, Investigation Leader, reviewed research conducted on the effects of pollutants on striped bass and gave Dr. Nyquist a tour of the laboratory facilities.

Hudson River Striped Bass to be Collected

Investigation leader Dr. Jeannette Whipple and Sharon Moreland, San Francisco State University, will travel to the Hudson River in New York, May 14-21, to sample 50 Hudson River striped bass for comparison with the California population. The trip is being sponsored by several groups in the Hudson River area. A group of five, including Whipple, Moreland, biological technicians Brian Jarvis and Michael Bowers, and Dr. Mike Moser, consultant in parasitology from the University of California, Santa Cruz, will work with Robert Boyle, from the east coast, who made this study possible.

Spring Sampling of Striped Bass Planned

Biological technician Brian Jarvis has organized the striped bass spring sampling program for 1982 and is enlisting the help of all members of the physiology staff for sampling. Because of the extremely wet year, 30 female striped bass will be taken in the field to serve as a monitoring sample; originally, no sampling had been planned for this year. Fish will also be collected for a laboratory experiment on blood and hormone effects.

* * * * *

This month oceanographer Dr. Bruce MacFarlane participated in a workshop on meaningful measures of marine pollution effects, sponsored by NOAA in Pensacola, Florida. MacFarlane presented a poster session outlining work the physiology staff have done on assessing pollutant effects in fish. The session emphasized techniques and included photographs of effects in fish.

* * * * *

Research chemist Pete Benville has completed the first draft of a paper entitled "Acute toxicity of seven alicyclic hexanes to striped bass (Morone saxatilis) and bay shrimp (Crangon franciscorum) in seawater." The manuscript is now under laboratory review.

PACIFIC ENVIRONMENTAL GROUP

FISHERY/ENVIRONMENTAL MODELING AND FORECASTING TASK

A Description of Eastern Boundary Current Comparative Studies

Comparative studies of environmental processes and fish reproductive strategies in four major eastern boundary current regions of the world's oceans are an important component of present research effort within the Fishery/Environmental Modeling and Forecasting Task at the Southwest Fisheries Center's Pacific Environmental Group (PEG) at Monterey, California. The four regions studied are 1) the California Current region, off the west coasts of the United States and Mexico; 2) the Peru Current region, off Peru and Chile; 3) the Canary Current region, off Portugal and Northwest Africa; and 4) the Benguela Current region off southwest Africa. These are the major coastal upwelling regions of the world, characterized by very high production of organic matter and producing a substantial portion of the world's harvestable fish supply. All four regions appear to have similar environmental dynamics and are dominated, in terms of pelagic fish biomass, by very similar assemblages of species. Each of the regions contains important stocks of anchovy, sardine, mackerel, jack mackerel, hake, and bonito. Often the same species is found in more than one of these regions.

Studies of environmental effects on recruitment in California Current fishery stocks have been hampered by lack of sufficient time series for empirical verification. Simply waiting for more annual data points to accumulate is not considered a satisfactory response to present needs. Some of the most important fishery events (e.g., collapse of a stock), have generally happened only once during a data record for a particular fishery. It is hoped that, by developing analogues among similar ocean systems, data from one regional system may be of use in drawing conclusions about another.

Global data sources made available through PEG's collocation with the U.S. Navy Fleet Numerical Oceanography Center enable PEG scientists to assemble seasonal and geographical climatologies of marine processes in the various regions in similar formats. These form a basis for pattern recognition of similarities and differences in the various spawning environments of analogous species. Natural selection implies that observed reproductive habits represent successful accommodation to the most crucial environmental factors. Thus, compelling patterns in reproductive and environmental relationships are suggestive of important linkages.

The development of a basis for comparing events within one ocean system with those in another is of great interest. For example, heavy fishery exploitation in the Peru Current has recently shifted a largely anchovy-dominated system to a sardine-dominated system. The presently expanding exploitation of California Current anchovies provides immediate relevance to

the degree of analogy between these two systems. In addition, the deduction of crucial environmental factors in this manner provides a rational basis for limiting the choices of explanatory variables in empirical models, thereby allowing more effective use of severely limited time series of annual data points in formulating environmentally-dependent recruitment models.

FISHERIES INFORMATION SYSTEMS AND AUTOMATIC DATA PROCESSING

Implementation of WPACFIN Proceeds

David C. Hamm, Computer Systems Analyst at the Honolulu Laboratory (HL), reports that the first data transmission from the HL Apple microcomputer to the East-West Center's PDP 11/70 minicomputer was accomplished using 1 year's data on a village fishing survey received from the American Samoa Office of Marine Resources. The communication links between the HL and the East-West Center's microcomputer is to be the central mainframe computer for use by WPACFIN, the Western Pacific Fishery Information Network. Hamm's report of the development of WPACFIN, "Preliminary description of the Western Pacific Fishery Information Network" (SWFC Admin. Rep. H-82-2), was distributed by Southwest Fisheries Center Director Dr. Izadore Barrett at a meeting this month of the Western Pacific Regional Fishery Management Council in American Samoa.

Hamm attended meetings this month with the staff of the Western Pacific Program Office, Southwest Region, to discuss plans for improvements in the data collecting and processing activities in the Commonwealth of the Northern Mariana Islands (CNMI) such as coordinating the development of an integrated approach to data collecting and processing activities using funds available to CNMI from several federal sources. The WPACFIN microcomputer will be the central unit used for data capture, storage, summarization, reporting, and transmission for systems developed.

Significant progress has also been made on the establishment of the Western Pacific Data Goals Committee. Draft guidelines for the Committee have been drawn up and the first meeting should be held in June.

CALFIN Memorandum of Understanding Drafted

The California Fishery Information Network (CALFIN) Memorandum of Understanding has been drafted by Fred Kellenberger, Data Systems Manager. The CALFIN is a cooperative effort among the Southwest Fisheries Center (SWFC), Southwest Region (SWR), and California Department of Fish and Game (CDF&G) to make information collected on marine fisheries in California available in a consistent, efficient, and timely manner to persons needing these data. The Memorandum defines the responsibilities of the SWFC, SWR, and CDF&G and outlines the scope, benefits, and funding provisions of the CALFIN. The Memorandum is currently being reviewed by Gary Smith, SWR, and Dick Heimann, CDF&G.

* * * * *

On April 7, data systems manager Fred Kellenberger discussed the Fishery Information Network project with the staff of the Southwest Fisheries Center's

Tiburon Laboratory. He repeated the discussion with members of the Center's Pacific Environmental Group in Monterey, California, on April 8.

Status of Coastwide Data System Reviewed

Susan Iacometti, Computer Systems Programmer, has reviewed the status of the Coastwide Data System, which contains 1974-1976 commercial landings data and vessel data for Washington, Oregon, and California. The Coastwide Data Base files were converted from INFONET system to standard ASCII magnetic tape files for implementation on the VAX computer system. Iacometti is designing the landings file and the vessel characteristics file for easy access by DATATRIEVE, a VAX management system. She is also summarizing weekly landing records into yearly summaries by vessels for industry economist Dr. Daniel Huppert.

Trial Use of Editing Terminal Arranged

Systems analyst Dorothy Roll has been researching a number of video terminals on the market as part of the selection of software and peripherals for the minicomputer the Center has requested for procurement. As a result of her investigation, Roll has arranged with Edgar Brugueras, sales representative for TAB Products, for trial use of the TAB 132/15 editing terminal. The TAB interactive terminal with a 15" display screen, which can emulate the DEC VT52 and VT100/VT132 terminals, has unique features not supported by other vendors. Some of these features include a 96-line memory (4 pages), soft keys which initiate more than one function depending on whether the terminal is in the set-up or operation mode, and two message lines at the bottom of the screen defining the operator's selections or terminal status.

Requirements for Reporting Full-Time Equivalence Reviewed

Robert Nydam, Computer Programmer Analyst, has reviewed the requirements for reporting the Full Time Equivalency (FTE) in the Financial Reporting System. He has structured the current data base files to include the FTE data elements. He is designing and testing the FTE data entry and update programs. The reporting of the FTE in the TDP month-end summary report is scheduled for May. The implementation of the other two required FTE reports is targeted for the June summaries.

Survey Reports of SWFC Microcomputers Prepared

At the request of NMFS Data Management Office in Washington, D.C., systems analyst Dorothy Roll has prepared survey reports of the microcomputers in the Southwest Fisheries Center's La Jolla, Monterey, Tiburon, and Honolulu Laboratories. She also inventoried communicating terminals and data communications requirements for NOAA Timeshare, at the request of NMFS headquarters. These requirements will be input to the specification package

for the recompetition of ADP Network Services, NOAA's current timeshare facility.

Three Technical Users Meetings Held in April

ADP Operations hosted three technical users meetings this month in addition to two tours of the University of California, San Diego (UCSD) Computer Center. The training sessions focused on UCSD's VAX procedures and capabilities, the DEBUGGER on the VAX, general maintenance of TI portable terminals, and the demonstration on paper loading of the printer and printer terminals in the users workroom. On April 8, Wayne Frater, Operations Supervisor at the UCSD Computer Center, conducted an excellent tour of their facilities. Nine users from the La Jolla Laboratory viewed the Burroughs, CATT, and VAX configuration and operations. The tour was repeated on April 20 and was attended by six users from the Laboratory. Another tour is scheduled for May to accommodate other users who wish to see the VAX configuration.

* * * * *

Systems analyst Dorothy Roll drafted a brief procedure to assist the Honolulu Laboratory in converting their file system to the NOAA functional filing system by the deadline date of March 1, 1983. Included were samples of a schedule for the conversion process and the functional file indexes used by the Southwest Fisheries Center's Oceanic Fisheries Resources Division, and the Office of Resource Conservation and Management, NMFS, Washington, D.C.

* * * * *

Dorothy Roll, Systems Analyst, reports that she has completed the 1982 performance standards for the Computer Systems Programmer and Computer Programmer Analyst positions in ADP Operations. She reviewed the standards and the target dates for the assigned tasks with the respective incumbents, Susan Iacometti and Robert Nydam.

MISCELLANEOUS

HONORS AND AWARDS

Honolulu Laboratory

Tamio Otsu, Supervisory Fishery Biologist, has been nominated for the Federal Manager of the Year award and Fletcher V. Riggs, Fishery Biologist, has been nominated for the Federal Employee of the Year award by the Honolulu Laboratory for the 1982 Federal Day Awards sponsored by the Honolulu-Pacific Federal Executive Board. Thursday, June 3, 1982 will be observed as Federal Day in Hawaii when all of the finalists from the Federal community will be honored at the awards luncheon.

PUBLIC AFFAIRS

Honolulu Laboratory

Honolulu Laboratory Participates in Science and Energy Fair

On April 23-24, personnel from the Honolulu Laboratory participated in a science and energy fair at the Leeward Community College. The fair was held to increase science awareness in the community, encourage ongoing programs in community outreach activities, emphasize the importance of research and its impact on each citizen's daily life, and provide opportunities for the faculty and staff of the Leeward Community College to become involved in service activities. Scientific and technical information were presented through displays, demonstrations, seminars, and films. At least 15 subject areas were covered, including energy conservation, alternate energy sources, communications technology, horticulture, marine sciences, aquaculture, water resources, and computer science. The crowd of about 4,000 which turned out for the 2-day event benefited from scientific expertise of some 70 scientists, engineers, educators, and science students including 25 University of Hawaii faculty and staff.

Research assistant Bernard M. Ito and scientific illustrator Tamotsu Nakata coordinated the Honolulu Laboratory's participation. Assisting Ito and Nakata in setting up, manning, and dismantling the displays were fishery biologists Paul M. Shiota, Ray Sumida, and Richard N. Uchida, and research assistants Richard A. Bierma, Alan Everson, Robert Humphreys, Jr., Walter Ikehara, Steven Kramer, Jeffrey D. Sampaga, Michael Seki, and Darryl Tagami.

* * * * *

On April 22, Laboratory Director Richard S. Shomura presented a talk on current fishery problems in the Pacific to a group of undergraduate and graduate students in Dr. James Parrish's fishery science class at the University of Hawaii.

La Jolla Laboratory

Science and Engineering Fair Students Tour Center

On April 22, nine junior high and high school participants in the 28th Annual Greater San Diego Science and Engineering Fair visited the Center's La Jolla Laboratory for a tour and demonstration of the research activities. The students were accompanied by David Fenner, Science Instructor at Serra Junior High School. Acting as host, general biologist Shari Sitko presented a slide show illustrating the wide scope of research activities at the Center's four component laboratories. Oceanographer Ron Lynn then described how Center scientists use remote sensing techniques to study the movements of tuna in the ocean, and biological technician Ron Dotson demonstrated some of the equipment used to track tunas which carry ultrasonic acoustic tags. The students then toured the Center, first visiting the larval lab where biological technician Betsy Stevens talked about the larval collections and studies and showed specimens. Other stops on the tour included a visit with biological technician Larry Hansen, who discussed how Center scientists count and study populations of pinnipeds along the California coastline and offshore islands, and wildlife biologist Dr. Al Myrick, who discussed techniques used to age porpoise teeth by counting their growth layer groups. At the end of the tour, the students were treated to an unrehearsed display of schooling anchovy and porpoise school movements in the waters west of the La Jolla Laboratory.

Dr. Izadore Barrett, Center Director, deputy director John Carr, and fishery biologist Dr. David Au served as judges at the Science Fair this year.

* * * * *

On April 14, industry economist Dr. Sam Herrick spoke to the San Diego Sport Fishing Association on the socio-economic research being conducted at the La Jolla Laboratory. Biological technician Ron Dotson also attended the meeting and discussed the Laboratory's work on sonic tracking of albacore.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

On April 29, Dr. Steve Reilly, Operations Research Analyst, presented a talk on gray whales and discussed careers in marine sciences as part of Careers Day at Torrey Pines High School, Del Mar, California.



Participants in the Greater San Diego Science and Engineering Fair pose on the Center grounds after a tour of the facilities.

Tiburon Laboratory

On April 23, Dr. Gordon Chan's class from the College of Marin, Kentfield, California, toured the Laboratory. Research chemist Pete Benville and physical science aid Robert Hamilton acted as hosts and discussed the research being conducted by the Physiological Ecology Investigation on the effects of pollutants on fish. Dr. Edmund Hobson, Leader of the Fish Communities Investigation, presented a talk on the ecology of California coastal fishes to the students.

PRESS RELEASES

Honolulu Laboratory

- April 6 - "Open house scheduled on NOAA Ship Townsend Cromwell."
19 - "Research vessel completes bathymetry survey cruise around Guam and the Mariana Islands."

La Jolla Laboratory

- April 21 - "White sea bass spawned in captivity for first time."

SEMINARS

Honolulu Laboratory

- April 30 - Dr. Richard W. Brill, Southwest Fisheries Center, presented a talk on "Metabolic function of the central vascular rete in tuna."

La Jolla Laboratory

- April 13 - Dr. David Au, Southwest Fisheries Center, presented a seminar on "Dolphin habitats in the eastern tropical Pacific."
20 - Dr. Roger P. Hewitt, NOAA Corps, Southwest Fisheries Center, spoke on "Pattern and survival of anchovy larvae."
27 - Dr. Mark Huntley, Scripps Institution of Oceanography, presented a talk on "Growth and ontogenetic, diel, vertical migratory behavior in Calanus pacificus."
- Dr. Paul E. Smith, Southwest Fisheries Center, spoke on "Quantitative plankton sampling and net design" at an AOS seminar at Scripps Institution of Oceanography, La Jolla, California.

TRAINING

La Jolla Laboratory

- March 30- April 1 - Lorraine Zorich, Administrative Assistant - "Personnel Management for Personnel Assistants," San Diego, California.
- April 15 - Emille Cole, Secretary - "Professional Secretary," San Diego, California.
- 19-21 - Dorothy Roll, Systems Analyst - "Data Communications: An Introduction to Concepts and Systems," Los Angeles, California.
- 27-29 - David Mackett, Planning Officer - "Capitol Hill Workshop," Washington, D.C.

VISITORS

Honolulu Laboratory

- April 2 - Dr. Dayton L. Alverson, former Director of the Northwest and Alaska Fisheries Center, NMFS, and presently a private fishery consultant, visited the Laboratory.
- 12 - Laboratory Director Richard S. Shomura was visited by Center Director Dr. Izadore Barrett, who was en route to American Samoa to attend the 35th Western Pacific Regional Fishery Management Council meeting.
- 17 - Dr. Izadore Barrett, Center Director, and Mr. William Gordon, Assistant Administrator for Fisheries, NMFS, stopped over in Honolulu en route home from the Western Pacific Fishery Management Council meeting in American Samoa. They were given a tour of the fresh fish market and the Honolulu Laboratory by Laboratory Director Richard Shomura.

La Jolla Laboratory

- April 1-2 - Dr. John Bengston, Research Associate with the British Antarctic Survey, came to the Center to confer with Dr. Doug DeMaster, Leader of the Coastal Marine Mammal Project, on research concerning Antarctic pinnipeds.

- 5 - Helen Chin and Allan Gluck, University of California, Los Angeles.
- 5-7 - Howard Fraley, NASO, Seattle, Washington, visited the Center.
- 7 - Dr. Eduardo Gaggero, Legal Advisor to the Uruguayan Directorate General of Civil Aviation and Delegate to the United Nations' Commission for Peaceful Uses of Space, came to the Center to meet with Reuben Lasker, Chief of the Coastal Fisheries Resources Division.
- 8-9 - Dr. John P. Harville, Executive Director of the Pacific Marine Fisheries Commission, visited the Center.
- 9 - Harvey Hutchings, Northwest Region, NMFS, Sam Bledsoe, Northwest and Alaska Fisheries Center, NMFS, and Gary Smith, Southwest Region, NMFS, came to the Center to attend the Fishery Information Network (FIN) planning and financing meeting.
 - Dana Pushell, Scripps Institution of Oceanography, La Jolla, California.
- 15 - Pat Lavin, Economist with the Pacific Fisheries Management Council, visited the Center and conferred with Dr. Daniel Huppert on fisheries planning and economics in California.
- 21 - Patty Zielinski, California Department of Fish and Game, San Diego, California.
 - Gary E. Davis, Channel Islands National Park, Ventura, California.
- 22 - K.V. Koski, Auke Bay Laboratory, NMFS, Auke Bay, Alaska.
- 27-29 - Henrietta Manipis, Office of Personnel Management, came to the Center to interview a selected group of staff members.
- 30 - Paul Abramson, San Diego State University, San Diego, California.

Tiburon Laboratory

- April 1 - Peggie Kohl, U.S. Fish and Wildlife Service, Sacramento, California.
- 8 - Howard Fraley, NASO, Seattle, Washington.

- 13 - Tom Jow, California Department of Fish and Game, Menlo Park, California.
- H.L. Millikan, Washington State Department of Fisheries, Seattle, Washington.
- Chuck Korson, Southwest Region, NMFS, Terminal Island, California.
- Jack Robinson, Oregon State Department of Fish and Wildlife, Newport, Oregon.

Pacific Environmental Group

- April 2-5 - J.R. Donguy, ORSTOM, Noumea, New Caledonia, discussed XBT monitoring in the tropical Pacific with Gunter Seckel, PEG Chief, and Douglas McLain.

MEETINGS AND TRAVEL

Honolulu Laboratory

- April 14 - Laboratory Director Richard S. Shomura attended the Hawaii/Pacific Islands Seafood Marketing Seminar, sponsored by the Pacific Tuna Development Foundation, in Honolulu, Hawaii. The seminar was also a part of the Catch America program of NMFS. The Honorable Daniel K. Akaka, the United States House of Representatives, delivered the keynote address.
- 15 - Richard S. Shomura, Laboratory Director, and Richard N. Uchida attended the 15th meeting of the Coordinating Council for Research--Northwestern Hawaiian Islands.
- 23-30 - Laboratory Director Richard Shomura traveled to (1) New Zealand to meet with G. Duncan Waugh and his staff at the Fisheries Research Division, Ministry of Agriculture and Fisheries, Wellington, and (2) Sydney, Australia, to serve as the U.S. Delegate at the SCORRAD meeting.

La Jolla Laboratory

- March 22- - Dr. Rick Methot traveled to Bodega Bay, California, to
April 1 work on dungeness crab research with Dr. Louis Botsford,
 University of California at Davis.

- March 29- - Dr. Izadore Barrett, Center Director, traveled to
April 1 Washington, D.C., to attend a Regional/Center/Office
Director's meeting.
- April 4-13 - Dr. Jay Barlow traveled to Tiburon, California, to
conduct an acoustic survey of cetaceans on board the R/V
David Starr Jordan.
- 4-26 - Dr. Doug DeMaster, Dr. Rennie Holt, and Lisa Ferm also
traveled to Tiburon to take part in the acoustic survey
of cetaceans on board the Jordan.
- 5-6 - Center Director Dr. Izadore Barrett, John Carr, Fred
Kellenberger, Dr. Reuben Lasker, Dave Mackett, Ben
Remington, and Dr. Gary Sakagawa traveled to Tiburon,
California, to attend the Center Management Meeting.
- 5-8 - Dr. Steve Reilly attend the NOAA/EDIS-sponsored workshop
on Marine Ecosystem Modeling held in Frederick, Maryland.
- 6-7 - Dr. Daniel Huppert traveled to Davis, California, to meet
with Phil Meyer and Associates regarding progress on the
Limited Access Study contract, and with the Marine Affairs
Subject Area Group of the California Sea Grant Program.
- 8 - An albacore Pacific coast port sampling meeting was held
at the Center.
- 9 - Dave Mackett and Fred Kellenberger attended a Fishery
Information Network (FIN) planning and financing meeting
at the Center.
- 11-16 - Robert Nishimoto traveled to Monterey, California, to
confer with Roy Mendelssohn, Pacific Environmental Group,
SWFC, and to use Mendelssohn's computer program to run
an analysis on albacore catch.
- 12-14 - Dave Mackett traveled to Honolulu, Hawaii, to attend a
planning session for Hawaiian monk seal research.
- 12-17 - Dr. Izadore Barrett, Center Director, traveled to
Honolulu, Hawaii, and Pago Pago, American Samoa, to attend
the Western Pacific Council meeting.
- Charles Oliver, Bill Brinkerhoff, and Larry Hansen
traveled to Long Beach, California, to conduct an aerial
survey of pilot whales and small cetaceans in the Southern
California Bight, in conjunction with the David Starr
Jordan shipboard survey.
- 12-22 - Dr. R. Michael Laurs traveled to the Oregon cities of
Portland, Astoria, Newport, Corvallis, Coos Bay, and

Brookings to present a series of workshops to fishermen on recent albacore research findings.

- 14-24 - Dr. Reuben Lasker traveled to Paris, France, to attend a meeting of SCOR WG-67 "Scientific Committee on Ocean Research," and to Brest, France, to give a seminar at CNEXO.
- 15-16 - Dr. Nancy Lo and Susan Picquelle traveled to Los Angeles, California, to participate in a workshop on applied statistics presented by the American Statistical Association.
- 24 - Jacqueline Jennings attended a seminar on the Law of the Sea Conference, held at the University of San Diego, San Diego, California.
- 25-29 - Dr. Rick Methot traveled to Davis and Fallen Leaf Lake, California, to give a presentation at a Pacific Fishery Biologist meeting.
- 26-29 - Center Director Dr. Izadore Barrett traveled to Washington, D.C., to attend the NOAA/NMFS State Fish and Wildlife Directors' Conference.
- 27-29 - Deputy Director John Carr traveled to Los Angeles, California, to participate in a University of Southern California Sea Grant Site Review as a member of the Site Team.
- Charles Oliver continued his pinniped studies on San Clemente Island, California.

Tiburon Laboratory

- March 29- - Dr. Jeannette Whipple and Michael Bowers traveled to
April 1 Pacific Grove, California, to attend a Biological Effects Workshop.
- 15-17 - Laboratory Director Norm Abramson and Peter Adams traveled to Arcata, California, to attend a Conference on Mathematical Models of Renewable Resources at Humboldt State University.
- 20-22 - Norman Abramson, Laboratory Director, traveled with Mel Odemar, California Department of Fish and Game (CDF&G), to the CDF&G Laboratories at Eureka and Menlo Park, California, in order to continue their survey of sampling procedures.

- 26-29 - Tina Echeverria traveled to Morro Bay, Monterey, Ft. Bragg, and Eureka, California, to review sampling procedures and to hire and train biological aids.

Pacific Environmental Group

- April 26-30 - PEG Chief Gunter Seckel traveled to Washington, D.C., to attend a meeting of the sampling strategy working group under the NAVY/NOAA Joint Ship-of-Opportunity Program and the National Climate Program Office. He also participated in discussions with the Director and staff at the Climate Analysis Center at the National Meteorological Center.

PERSONNEL ACTIONS

Honolulu Laboratory

- April 4 - David C. Hamm, Computer Systems Analyst - Promotion.
- Lance S. Asagi, Biological Aid - Conversion to Excepted Appointment.
- 5 - Luther C. Gregory, Biological Aid - Temporary, Full-time Appointment.
- 18 - Lynn M. Hondonero, Clerk (Typing) - Conversion to Excepted Appointment.

La Jolla Laboratory

- April 1 - Mark Zdeb, Computer Clerk - Resignation.
- 4 - Jane McMillan, Industry Economist - Leave Without Pay.
- 15 - William Davis, Computer Clerk - Temporary Intermittent Appointment.
- 18 - Carol Miller, Computer Programmer - Temporary, Full-time Appointment.
- 20 - Rebecca Hankins, Computer Assistant - Temporary, Full-time Appointment.
- 21 - Nancy LaRoche, Secretary - Redescription.

- 28 - Lorraine Zorich, Administrative Assistant - Leave Without Pay.

Tiburon Laboratory

- April 26 - Jerry Kwiecien, Biological Aid - Temporary Appointment.
- Kathleen Mathews, Biological Aid - Temporary Appointment.
- Lisa Nathanson, Biological Aid - Temporary Appointment.
- Laura Young, Biological Aid - Temporary Appointment.
- 27 - Tammie Castillo, Clerk-Typist - Permanent, Full-time Appointment.

UNITED STATES
DEPARTMENT OF COMMERCE

AN EQUAL OPPORTUNITY EMPLOYER

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
SOUTHWEST FISHERIES CENTER
8604 LA JOLLA SHORES DRIVE
P.O. BOX 271
LA JOLLA, CALIFORNIA 92038

OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE, \$300

POSTAGE AND FEES PAID
DEPARTMENT OF COMMERCE
210



THIRD CLASS

N.M.F.S. L01
P.O. BOX 3830
HONOLULU, HAWAII 96812